Service Manual

FOR

Varian 380-LC & 385-LC

EVAPORATIVE
LIGHT-SCATTERING
DETECTOR

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PL0890-0360

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INTRODUCTION

The combined Varian ELSD Service Manual is designed for use by personnel who have had training and are experienced in servicing this type of equipment. Whilst the ELSD has been designed for easy repair, there are potential hazards associated with servicing this instrument. We strongly recommend that our service engineers perform all servicing

It is understood that the purchaser must assume all risk in the use of this manual for the purpose of performing service upon the instrument it covers. There are no user-serviceable parts in the Varian ELSD

Varian, Polymer Laboratories strongly recommends the use of original Varian spare parts only, otherwise we do not guarantee any specification or liability

It is strongly recommended that the operator read the entire manual carefully before attempting to service the instrument. In addition, be sure to observe all signs and pictographs that are specifically defined as follows:

WARNING:
The “warning sign” denotes a hazard. It calls attention to a procedure, practice which, if not correctly done or adhered to, could result in severe injury or damage or destruction of the instrument. Please do not proceed beyond a warning sign until the indicated conditions are fully understood and met.

ATTENTION:
The “attention sign” denotes relevant information. Read this information first before proceeding, it will be helpful or necessary to complete the task.

NOTE:
The “note sign” denotes additional information.
It provides the user with advice and suggestions to facilitate the operation of the instrument

SAFETY

WARNING

The following procedures require opening the main cover of the detector. Always ensure that the detector is disconnected from the mains power when the side panel is opened. The Varian ELSDhas a safety bar at the power input socket that prevents the detector's side panel being opened when the power cable is still connected.

ATTENTION

To disconnect the detector from the mains supply line, unplug the power cord. When working with solvents please observe appropriate safety procedures (for example, safety goggles, gloves and protective clothing), especially when toxic or hazardous solvents are used.

NOTE

Electronic boards and components are sensitive to electronic discharge (ESD). In order to prevent damage always use ESD protection when handling electronic boards and components.

WARNING

The LED light source is a Class 1 LED product. Temporary discomfort may result from directly viewing the light produced by this source. Do not look into the beam.

ATTENTION

Make sure that only fuses with the required rated current and of the specified type (super-fast, fast, time delay etc) are used for replacement. The use of repaired fuses and the short-circuiting of fuse-holders must be avoided.

NOTE

Any adjustment, maintenance, and repair of the opened instrument under voltage should be avoided as much as possible. When inevitable, this should only be carried out by a skilled person who is aware of the hazards involved.
Use of a mains isolating transformer is recommended.

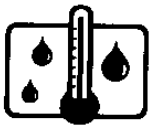
ATTENTION

Read and understand the Varian ELSD user manual before undertaking any service operations on this instrument.

INSTALLATION

Site Preparation Check List

Environmental Conditions



Temperature 15° to 35°C (59 to 86°F)
At constant temperature
Avoid positioning in direct sunlight
Humidity 10-80%

Power

USA and Japan 115V (AC) ±10%
50/60 Hz, 2A max, with a protective earth connection.
Europe 230V (AC) ±10%
50/60 Hz, 2A max, with a protective earth connection.

Gas Supply

Gas: Nitrogen (98% purity or better and filtered to 0.2µm)

Notes:

⇒ *Air can **only** be used for non flammable solvents*

⇒ *The mass flow controller is not calibrated for use with gases other than Air or Nitrogen*

⇒ *For operation with other inert gases contact Polymer Laboratories for advice.*

Gas flow: up to 3.25 SLM @ 60 psi @ 25°C
Pressure operating range: 60 – 100 psi (4-6.7 bar)
Maximum Pressure: 100 psi (6.7 bar)

Extraction Requirements

During normal operation the carrier solvent is evaporated as it passes through the instrument and must be extracted safely at the rear of the unit.

The exhaust from the instrument (13mm ID PVC tubing) must be extracted to a fume hood or similar solvent disposal unit. If the extraction tube provided with the instrument is to be extended it is recommended that the diameter of the extension is increased to at least 50mm (2") diameter tubing so the extraction quality is not inhibited.

Unpacking the detector

Care has been taken to ensure that the instrument should be received in proper condition. The packing and protection are designed for normal hazards of road, rail or air transit. Any damage to the container or instrument should be reported immediately to your local distributor, or to Varian. It is recommended that the shipping container be kept, if possible, for re-shipment or return to a service centre.
Examine the shipping carton for visible signs of exterior damage. Unpack the instrument and examine it for transit damage. Check that all items on the packing list are included.
Notify your local distributor or Polymer Laboratories, Varian of any damage or missing items.

Packing list

- Varian ELS Detector
- Operation Manual
- Control Software[SMB1]
- Mains leads (UK, EUR, USA)
- RS232 data cable
- Analogue output Cable
- Gas Tubing (2m)
- PVC Exhaust hose (2m)
- Tygon SE200 waste hose (7cm)
- 500ml Solvent waste container

Power Connections

- Before connecting the power cable, ensure the instrument voltage rating matches your local power supply.
- Use only a supply with protective grounding.
- The correct fuses should be installed.
- For 115V (AC) or 230V (AC) use two 250V H 2A T fuses

THIS UNIT IS DOUBLE - FUSED.

RISK OF FIRE, REPLACE FUSES AS MARKED!

If the voltage rating and fuses are correct for your power source, connect the power cable

Gas Connection

The instrument should be supplied with clean, dry nitrogen gas at a minimum head pressure of 60psi. A 4mm push-in connector is provided at the rear of the instrument for a convenient connection to the gas source.

To prevent against unnecessary gas usage, an automatic but controlled gas shut off valve is integrated into the gas inlet manifold. This will only allow gas to pass into the instrument when the instrument is operating. Should the instrument default to a standby mode the gas valve will close after 15 minutes.

THE GAS INLET VALVE WILL BE CLOSED WHEN THE INSTRUMENT IS FIRST POWERED ON AND WILL ONLY OPEN ONCE THE INSTRUMENT IS SET TO RUN MODE

Fluid Connection

The eluent from the chromatography system is connected to the front of the instrument via the low dead volume Valco bulkhead connector provided.

USE ONLY VALCO FITTINGS

The liquid inlet port is connected directly to the nebuliser by a short length (130mm) of capillary tube giving a delay volume from port to nebuliser tip of ~5µl.

Extraction

The Varian ELSD is provided with tubing for venting the exhaust gases and vapors, and so does not need to be placed in a fume cupboard. Instead, the exhaust hose provided must be attached to the rear of the unit and vented to a fume hood or other disposal unit. Ensure the exhaust hose has an upward slope from the Varian ELSD so that any condensed solvent is collected in the waste bottle at the front of the unit and to prevent it accumulating in the tubing.

THE EXHAUST MUST BE EXTRACTED TO A SUITABLE FUME EXTRACTION SYSTEM

Data Connection

Analogue Signal Connector

The Varian ELS detector is supplied with a 1V analogue output cable (PL0890-0300) that allows data collection via an A/D interface, such as a Star MIB 800 module. The gold end fitting of the analogue cable plugs into the gold pin on the rear of the detector and the opposite end connects to the positive and negative inputs of the A/D interface.

Serial RS232 Connector

The Varian ELS detector is fitted with a standard RS232 (DTE-DCE) 3-wire serial interface.
The serial RS232 connector provides a 24bit (10 or 40Hz) digital output for connection to a PC running a data acquisition package (e.g. Galaxie Chromatography software.
If controlling the instrument from a PC, a free serial port is required. A USB port on the PC can be used but a USB-to-Serial adapter is required (PL0860-0620).

The Varian ELS detector is also fitted with a service connector, located below the RS232 port, for flash upgrading firmware (see pg 71)

Connection to a Varian Star 800 Module Interface Box

The Star 800 Module Interface Box (MIB) provides analogue-to-digital signal conversion (ADC). Connections are made by connecting the analogue output cable to one of the analogue signal input ports on the middle right side of the Star 800 MIB. For more information about connecting your Varian ELS detector to a Star 800 MIB, refer to your Star 800 MIB documentation.

Control I/O connector

The Varian ELS detector can be connected to auxiliary equipment, such as an autosampler, or pump via the 15pin I/O connector. The I/O connector can be configured in several ways to allow on-board timetable events to be triggered or to remotely auto-zero and shutdown the detector.

The ELS detector is equipped with 2 contact closures (normally-open) for stopping the operation of a pump if the unit reports an error condition.

The Varian ELS detector is also equipped with one contact closure, which is normally open, and two TTL logic inputs, both active-low (with internal pull-up resistors to 5 V).

NOTE

Pump stop facility must be employed if the instrument is to be left unattended, or if units are stacked.

	I/O description	Pin number
Inputs	Remote Start	14 & ground
	Remote Standby	13 & ground
	Remote A/Z	7 & ground
Output	Pump stop contact closure – normally open	3 & 10
	Ground (to case)	1, 5, 6, 11

Varian ELS detector I/O connections

The instrument is not supplied with a 15 pin I/O cable for the I/O socket or remote start cable. For remote start operation, and I/O connections additional cables are required and can be purchased from Varian Inc (Remote start cable Part # PL0890-0350, I/O Cable PL0890-0345).

Installing the Detector

Connect the power cord to the IEC inlet at the rear of the unit.

- Check the operating voltage of your instrument, 110V 2A or 230V 2A, on the IEC inlet fuse-holder on rear of unit.
- Attach the gas inlet tube to the gas inlet at the back of the instrument.
- The gas connection is a 4mm OD push-in fitting. The nitrogen gas should be dry, filtered and have a minimum inlet pressure of 60psi, 60-100psi is required to achieve the maximum operating instrument gas flow rate of 3.25 SLM throughout the temperature range.
- Connect the waste tube to the waste outlet at the front of the detector and position the other end in a waste collection bottle.
- The solvent waste container supplied with the detector can be sited on the bench in front of the instrument. Alternative waste collection vessels can be used if required but the bottom of the waste tube must be below the height of the waste outlet from the instrument. The waste tube must NOT be submerged in the liquid.
- Connect the exhaust hose between the exhaust outlet and a fume hood.
- Connect the instrument to the data recorder (computer, chart recorder, etc.) using the cable provided. One output socket is provided giving a signal in the 0-1V range.
- Connect the column outlet to the eluent inlet at the front of the unit) using a short length (10cm) of tubing (1/16" OD, 0.010" ID) and a 1/16" Valco fitting.
- Turn on the source gas to a pressure of about 60-100 psi. The gas will not flow though the detector until the instrument in set to RUN mode.
- Switch on the ELSD and select method "XXX".
- Start heating by selecting RUN mode using the arrow keys on the front keypad.
- When the unit has equilibrated, the baseline should be checked to ensure that it is acceptable for the experiment. At this point, with no liquid flowing into the instrument, the noise should be no more than 0.3mV peak-peak. This verifies that the gas supply is clean and dry. Any spikes in the baseline are usually indicative of particulate matter or water in the gas supply.
- Turn on the eluent flow and allow the system to stabilize for approximately 15 minutes.

NOTE

THE ELUENT FLOW CAN BE TURNED ON BEFORE THE INSTRUMENT HAS REACHED EQUILIBRIUM. IF THE ELUENT IS NOT EFFICIENTLY NEBULISED IT WILL EXIT THE INSTRUMENT FROM THE NEBULISER DRAIN TUBE.

- Again check the baseline noise as it should not have increased significantly. and should be <1mV. Typically the baseline noise is 0.3mV peak-peak.

If the baseline noise is excessive, then one of the following may be taking place: -

- poor evaporation due to gas flow being too low
- poor evaporation due to evaporation temperature being too low
- poor nebulisation due to temperature being too high and solvent boiling

Any of these problems will cause the baseline to shift upwards, as the amount of scattered light within the instrument has increased. If the baseline continues to show unacceptable noise even when the evaporation conditions have

been improved, and the solvent does not contain non-volatile species, then please refer to Chapter 5 Troubleshooting.
Where noise and all other conditions are acceptable, the instrument is ready to begin work.

NON-VOLATILE BUFFERS ARE NOT COMPATIBLE WITH THE ELSD

Storing the Instrument

If the instrument is to be stored or not used for a period of time it is recommended to follow the procedure outlined below:-

- Allow the instrument to cool to ambient temperature in STANDBY mode with the gas supply still connected.
- Tip the instrument forwards and empty the 'P' trap contents through the front waste tube (i.e. into the bottle)
- Pour 10 to 20mls of acetone into the exhaust tube to flush out the P trap, collecting the waste in the waste bottle at the front of the instrument.
- Again tip the instrument forwards to drain the p-trap
- Disconnect the waste bottle
- Using the gas supply, blow nitrogen gas through the exhaust to evaporate any remaining acetone in the p-trap. Cover the waste tube with tissue paper to collect any acetone residue.
- Plug the exhaust and waste tubes with the plastic caps provided.
- Plug the solvent inlet.

OPTIMISING DETECTOR PERFORMANCE

General Considerations

The Varian ELSD instrument should be thought of as a detector like any other designed for liquid chromatography. The main distinguishing feature is the ability to evaporate the solvent from the column eluent. Therefore, normal system set-up precautions should be remembered when starting to use the instrument. Any solvent intended for use with the ELSD should be fully miscible with any previously used in the liquid chromatograph; if there is any uncertainty, a mutually miscible solvent should be run through the system as an intermediate liquid. The sample loop should also be flushed with miscible solvent where necessary. The intended eluent should be thoroughly degassed, contain no non-volatile salts or material and should be fully compatible with the column(s). All connections should be made with zero dead volume fittings and tubing with an I.D. <0.010".

The Varian ELSD requires nitrogen (purity >98%), capable of generating 60-100psi inlet pressure. If in-house nitrogen is not available then we recommend the use of a nitrogen generator, giving a constant uninterrupted supply of high purity gas. Air can be used with non-flammable solvent systems. The eluent of choice should be fully volatile under the chosen detector parameters – any non-volatilised eluent will increase baseline noise and reduce sensitivity.

Optimisation Parameters

Gas Flow

An increase in gas flow rate causes a decrease in signal response. Lower gas flow rates are more favourable since less gas is consumed and a better sensitivity is achieved. However, there comes a point at which this benefit is counterbalanced by the increase in baseline noise due to inefficient evaporation of the eluent. In general, gas flow rates of 1.0-2.0SLM tend to be a reasonable compromise between baseline stability and high reproducible response for eluent flow rates >0.5ml/min. Reducing the eluent flow allows a reduction in the gas flow rate to maintain the optimum particle stream concentration, resulting in greater sensitivity.

When operating the Varian 385-LC at sub-ambient temperatures in aqueous solvents, gas flow values of >2.0SLMs maybe necessary to control the baseline noise.

Evaporator Temperature

The effects of altering the evaporator temperature tend to be less dramatic than changing the gas flow, although the temperature must be high enough to evaporate the solvent and to sufficiently dry the particle plume without having a detrimental effect on the sample being studied.

The Varian ELSD can be operated at sub-ambient temperatures to improve the detection of semi-volatile compounds. In aqueous solvents, baseline noise may become too excessive at temperatures <15°C. However, for organic solvents, the baseline can be controlled down to 10°C, provided the gas flow is increased to compensate.

Nebuliser Temperature

The nebuliser temperature is the parameter requiring least adjustment. In the majority of cases the nebuliser temperature is set to the temperature of the chromatography system. However, increasing this temperature can improve instrument performance by increasing the efficiency of nebulisation by reducing the viscosity and surface tension of incoming solvent. Setting the nebuliser temperature too high may result in a deterioration of detector performance due to solvent boiling in the nebuliser, giving rise to increased noise on the baseline due to spiking

Optimisation Procedure

Set the system at the minimum evaporator and nebuliser temperatures and a gas flow rate of 1.6 SLM. Make an initial injection of the test component and monitor the signal response. With each subsequent injection increase the

nebuliser and evaporator temperatures by 10°C whilst reducing the gas flow rate, until optimum sensitivity is achieved. In some cases, especially for volatile samples, it has been found that maximizing the nebuliser temperature permits a lower evaporator temperature and thus an increase in sensitivity

OVERVIEW OF DETECTOR'S OPERATION MODES

The Varian ELSD can be operated in two modes; STANDBY and RUN as described below:

To display the current mode and/or select a new mode, highlight the *MODE* function on the instrument display. The current mode will now be displayed on the screen. Using the ▲▼ keys, scroll up or down until the desired option is displayed. The instrument acknowledges the command by displaying the mode of operation in the top right hand corner of the screen.

Standby Mode

The STANDBY mode is the "ground state" of the Varian ELSD instrument, which is initiated automatically after power on. In this mode of operation the heaters are off, and the gas manifold valve is closed. The STANDBY mode enables the user to set-up the operational parameters (gas flow, nebuliser and evaporator temperatures) before switching the unit into RUN mode. The instrument will default to STANDBY mode should an error occur on the instrument

When the instrument is switched from RUN mode to STANDBY mode, following a command or error then the gas flow is set to a minimum flow of 1.2SLM for 15minutes before the gas manifold valve is closed. This minimum "blanket" gas is enough to nebuliser and evacuate solvent should the instrument default to STANDBY mode with solvent still flowing [firmware 1.1.8 or later].

If the Instrument is left in STANDBY mode for longer than 15mintes, gas flow to the unit is stopped to minimize gas usage.

It is strongly recommend that the pump stop from the I/O connector of the Varian ELSD is connected to the HPLC pump to prevent solvent flooding of the detector should an error occur

Run Mode

The RUN mode is the detector's normal operational mode. In this mode, the instrument controlled at the set temperatures and gas flow, and the system is fully operational. During heating or cooling the instrument will display 'NOT READY' to show the system has not

reached the set conditions. When the instrument has reached the set conditions and equilibrated, 'READY' will be displayed and the instrument is ready for use.

USING THE INSTRUMENT IN 'NOT READY' STATUS MAY NOT PRODUCE CONSISTENT RESULTS ACCORDING TO THE SET PARAMETERS, AS THE SYSTEM IS NOT EQUILIBRATED.

TROUBLESHOOTING

If a problem is encountered Polymer Laboratories advises a system test be performed via the Varian ELSDPC control software to ensure that the detector is working correctly. If there is an error or fault, please refer to the following table. If you follow the recommended course of action and the result is not satisfactory, then please direct the matter to Polymer Laboratories or your local distributor.

Instrument Error Codes

Error Code	Description	Suggestions
10	Air Temp <= 10°C Inside Enclosure	Environmental Temp Too Cold
11	Air Temp > 40°C Temp Inside Enclosure	Environmental Temp Too Hot
12	On-Board Sensor Heater Failed	Vapour Sensor Needs Replacing (see page 27)
13	Rear Panel Sensor Heater Failed	Vapour Sensor Needs Replacing (see page 27)
14	Leak Detected Inside Unit	Solvent Vapour Detected. Stop Pump
15	Liquid Leak Sensor Has Detected Liquid In Drip Tray	Liquid In The Base Of The Unit- Stop Pump And Investigate
16	Fan Driver IC Thermal Shutdown	Fault With The Circuitry / Wires / Fan
17	Fan Stopped	Fault With The Circuitry / Wires / Fan (see page 30)
18	Nebuliser Temperature Exceeded Threshold After Stabilizing	Faulty Thermocouple Or Heater Control
19	Evaporator Temperature Exceeded Threshold After Stabilizing	Faulty Thermocouple Or Heater Control
20	Light Source Error	Replace Light Source Assembly (see page 38)
21	Evaporator Gas Flow Rate Exceeded Threshold After Stabilizing	Check Operating Head Pressure, Otherwise Faulty Mass Flow Controller (see page 37)
22	Invalid Nebuliser Temp Reading (FAULTY RTD)	Replace Nebuliser Heater Assembly (see page 22)
23	Invalid Evaporator Temp Reading (FAULTY RTD)	Replace Evaporator Assembly (see page 32)
24	Fan failure on cooled evaporator	Replace Cooled Evaporator Assembly (see page 43)
25	Bridge current outside of normal range	Replace Cooled Evaporator Assembly (see page 43)

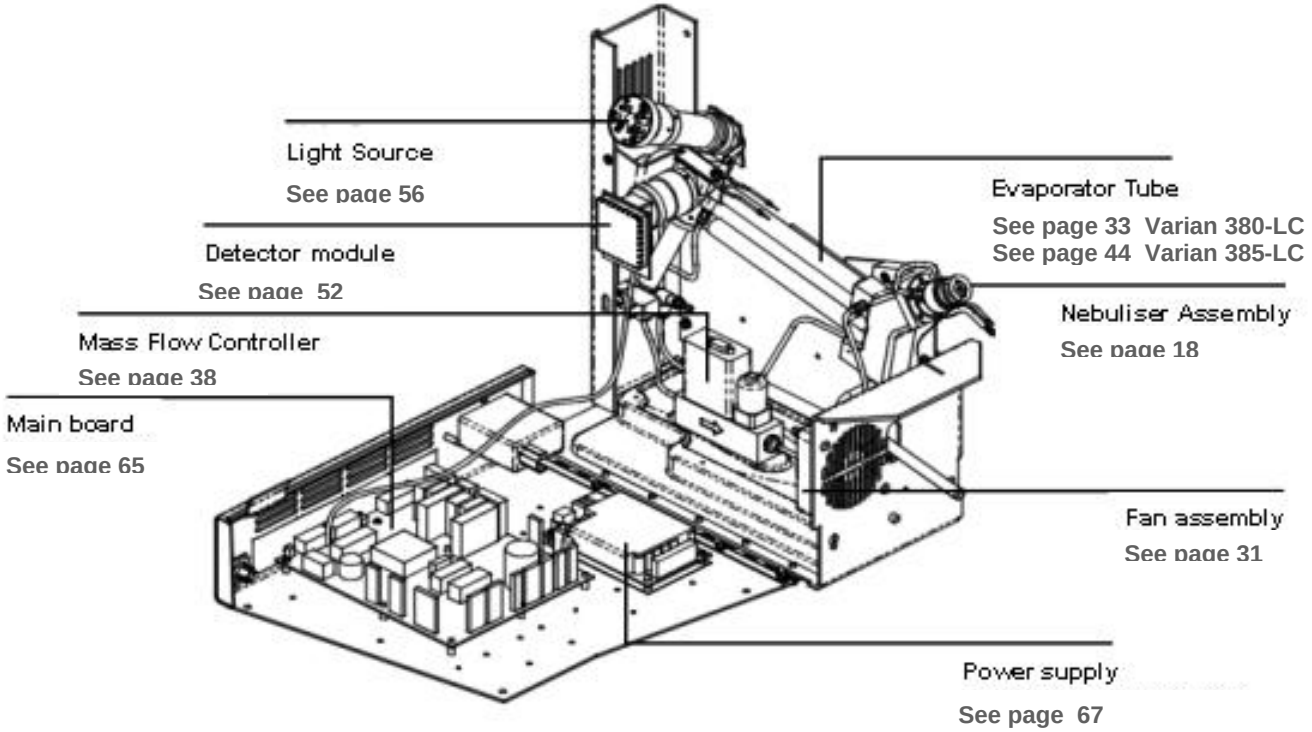
General Problems

Fault/Problems	Possible Cause(s)	Remedy
Baseline noise	The particle plume is not sufficiently dried in the evaporator tube.	• Increase the temperature of the evaporator by 10° intervals until the noise is acceptable
Baseline noise	Poor nebulisation of solvent	• Increase the gas flow rate • Decrease the nebulisation temperature
Baseline noise	Pump pulsations, especially in microbore applications where low flow rates are used.	• Use a pulse free pump • Increase the back pressure on the pump by fitting a back pressure regulator between the pump and the injection valve. • Use a pulse dampener directly after the pump in the system.
Baseline spikes	1. Particulate matter in the gas supply 2. Column shedding 3. Poor nebulisation	• Filter the incoming gas, or change the supply • Replace column or fit an inline filter with a 0.2µm membrane filter directly after the column. • Nebuliser temperature may be too high and solvent may be boiling; reduce nebuliser temperature
Low sensitivity and baseline noise	Diffuser saturated with solvent	• Stop the eluent flow and increase the evaporator temperature to 50°C above the current set temperature. Increase the flow rate to 2.8SLM and wait 15mins.
Large Baseline offset	1. Inefficient evaporation 2. High concentration of non-volatile buffer or stabiliser 3. Contaminated diffuser	• Increase the evaporator temperature and/or gas flow. • Use a lower concentration of stabiliser, unstabilised solvent or a more volatile buffer • Perform 'steam clean'. (Section 4.2 Operation's manual)
Peak tailing	Eluent particles lingering in the optical chamber	• Increase gas flow rate
Instrument Fails to zero	Offset too high or output unstable	• Ensure the instrument is in RUN mode • Refer to local distributor or Polymer Laboratories
No power	1. Mains lead not connected 2. Fuse failure	• Attach mains lead to socket and inlet on rear of instrument • Replace fuse
No response (completely flat baseline)	1. Data acquisition leads not connected 2. Light source inactive 3. Instrument in STANDBY mode	• Ensure connectors to computer or integrator are sound • Check LED • Select RUN mode
Temperature error as soon as instrument powered on	Temperature probe fault or disconnected	• Check RTD connections
Display not on, but power connected, blue glow ON.	Instrument in service mode	• Rear panel switch-set to RUN

REPAIRING THE VARIAN ELSD

Overview of Main Assembly

To allow easy access to the internal components of the Varian ELSD, the left-side panel folds outwards. The lock is located at the rear of the instrument, which can be opened using the access key (part # 0890-0440)



Removing The Front Panel

When required: For majority of internal repairs

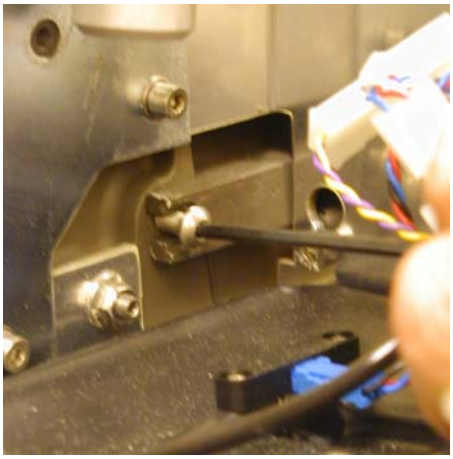
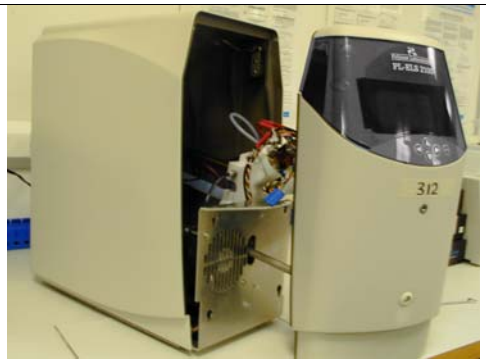
Tools required: Allen keys
Varian ELSD Enclosure Access Key (# 0890-0440)

Parts required:

Ensure that the detector is disconnected from the mains power before proceeding.

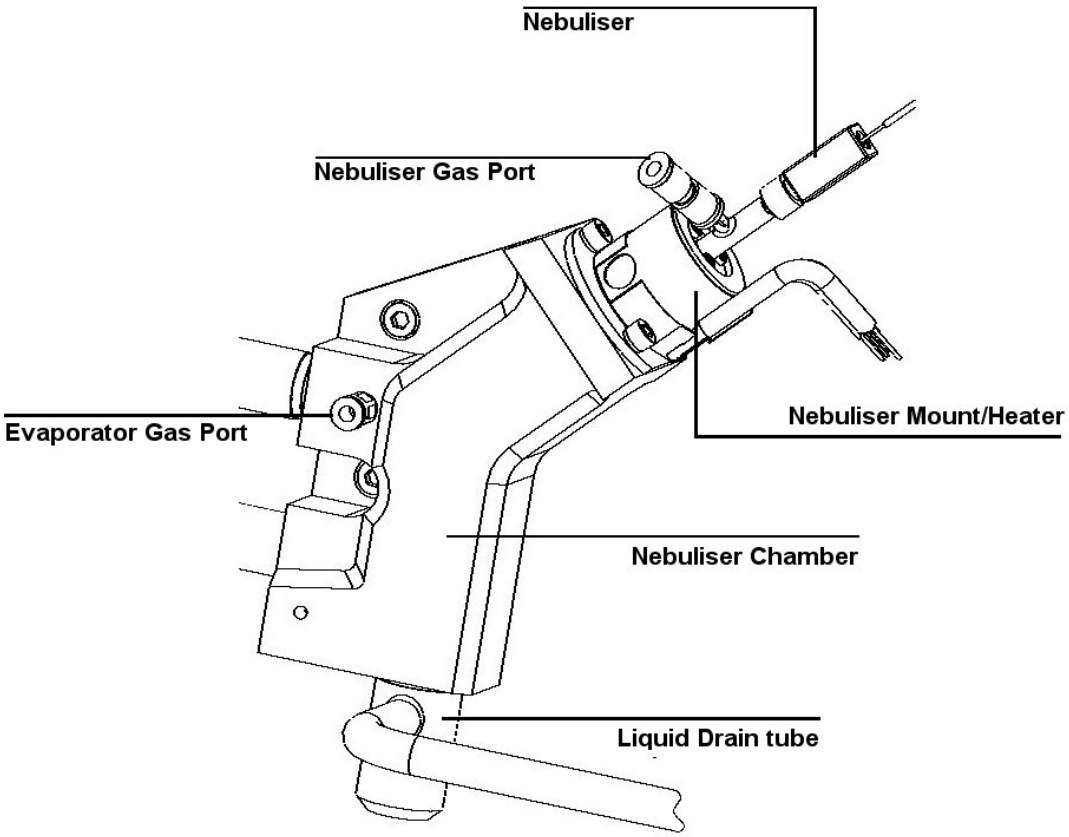
To prevent personal injury, the power cable must be removed from the instrument before opening the detector. Do not connect the power cable to the detector while the covers are removed.

Use the Access key to open the lock located at the rear of the instrument. Fold down the left-side panel of the detector	
Disconnect the nebuliser tubing and cables from the inside of the front panel.	

Remove screws located at the top and bottom of the inside side panel, to allow removal of the front panel.	
Remove the front panel by lifting and pulling backwards, to release the four locating screws from the bulkhead.	
	

Overview of Nebuliser Assembly

The nebuliser assembly is based around a nebuliser chamber (white PTFE block) into which the nebuliser, drain tubes, gas tubes and evaporation tube are connected. Access to the nebuliser section requires the removal of the front panel (see page 15)



Removing The Nebuliser

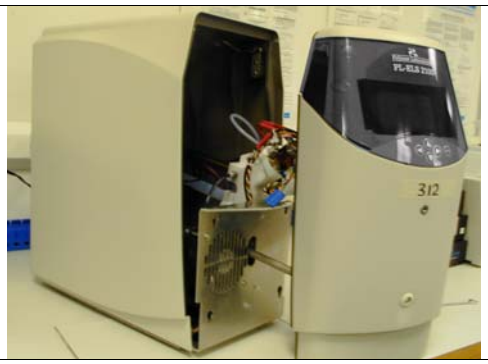
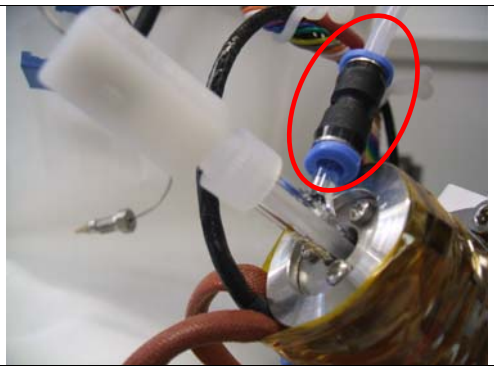
When required: If Nebuliser becomes blocked

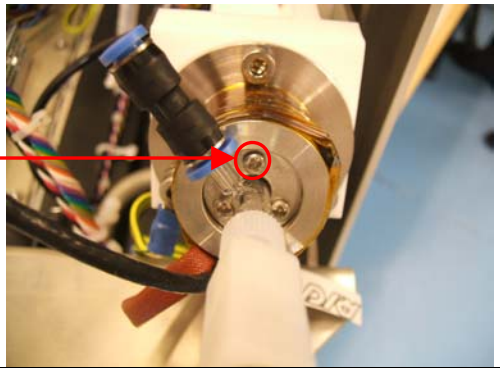
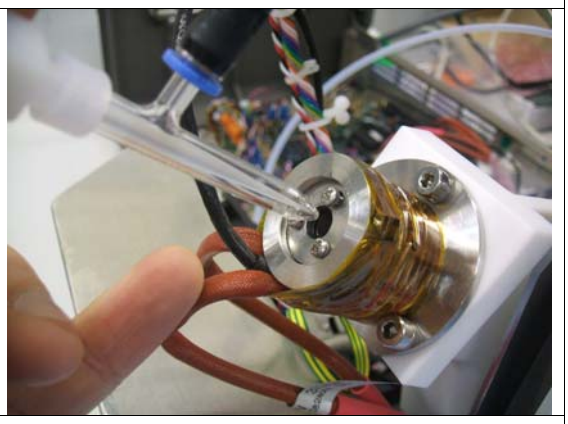
Tools required: Allen keys
Spanners

Parts required: ELSD Nebuliser (# 0890-0390)

Ensure that the detector has cooled down before proceeding

Ensure that all gas and solvent connections are disconnected prior to proceeding

Open the detector and remove the front panel as described in *"Removing the front panel"*(pg 15).	
Disconnect the nebuliser tubing from the inlet bulkhead. Disconnect the gas inlet as highlighted	

Loosen the nebuliser mounting plate by loosening the top screw as highlighted	
VERY carefully remove the nebuliser from the mount as shown Check the nebuliser for damage or blockages To install the nebuliser see "*installing the nebuliser* section (pg20)	

NOTE

DO NOT PLACE THE NEBULISER IN AN ULTRASONIC BATH

BLOCKAGES MUST BE REMOVED USING A SPECIAL CLEANING TOOL

Installing The Nebuliser

When required: If Nebuliser becomes blocked

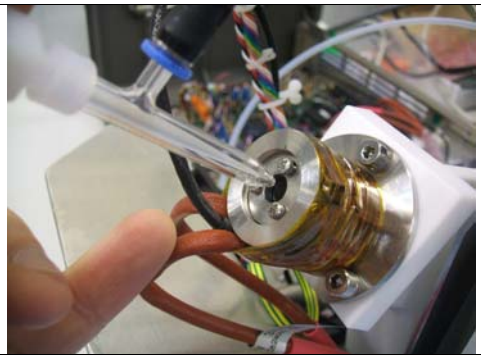
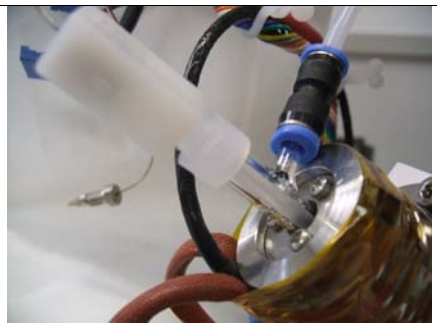
Tools required: Allen keys
Spanners

Parts required: ELSD Nebuliser (# 0890-0390)

Ensure that the detector has cooled down before proceeding

Ensure that all gas and solvent connections are disconnected prior to proceeding

Check that the nebuliser is not damaged before removing from packaging.	
Fit the gas connector and finger-tight connector to the nebuliser as shown. Connect the nebuliser to the inlet tubing via the union connection	

Very carefully insert the nebuliser into the nebuliser mount	
Connect the gas tubing to the nebuliser	
To check the correct gas flow is being delivered to the nebuliser, connect a gas flow meter in-line between the gas regulator (shown), and the nebuliser. NOTE: the instrument needs to be switched on and set to run mode The correct gas flow to the nebuliser should be 0.40SLM. If the gas flow is incorrect adjust the gas regulator, by pulling down the black knob and twisting, until the correct flow is achieved Disconnect the in-line flow meter and reconnect the regulator to the nebuliser. The IQ/OQ procedure must now be preformed to ensure the detector is performing as specified (see PMT section pg 51)	

NOTE

A quality control test must be performed following nebuliser removal, to ensure detector performance. (Appendices 3 and 4 Varian ELSD Operation Manual)

Replacing The Nebuliser Heater Assembly

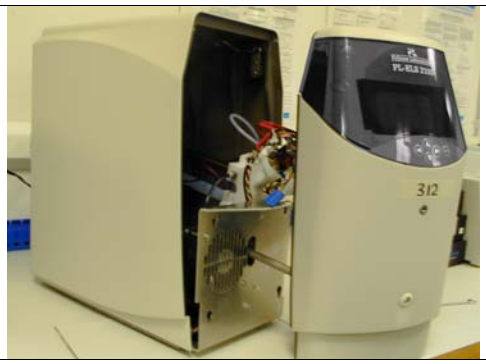
When required: Failure of Nebuliser heater

Tools required: Allen keys
Spanners

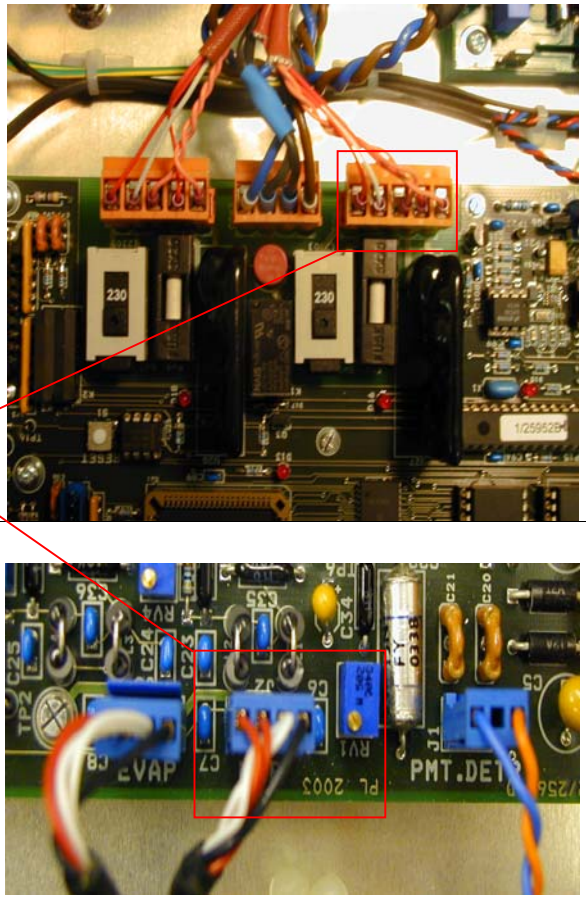
Parts required: Varian Neb mount assembly (#PL0890-0485)

Ensure that the detector has cooled down before proceeding

Ensure that all gas and solvent connections are disconnected prior to proceeding

Open the detector and remove the front panel as described in *"Removing the front panel"*(pg 15).	
Remove the nebuliser as described in *"Removing the nebuliser"*(pg 18). Disconnect the gas tubing from the nebuliser mount and Remove the three mounting screws with an Allen key as shown.	

Disconnect the two Nebuliser Heater Assembly cables from the main control board (NEB.HTR & NEB) and remove the nebuliser heater assembly.



ATTENTION

Ensure that the earthing cable is connected to the nebuliser heater assembly before switching on the instrument

Replacing The Nebuliser Chamber

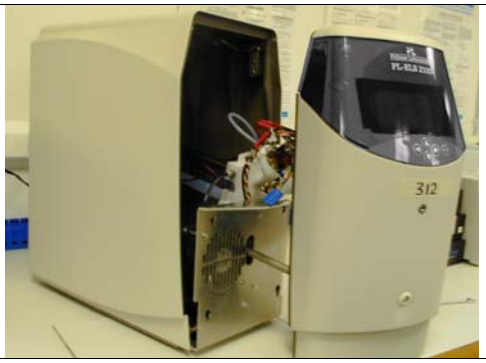
When required: Blocked or contaminated Nebuliser.

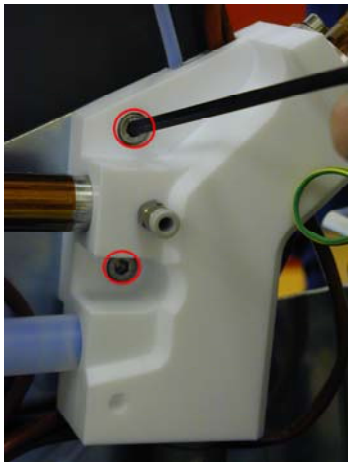
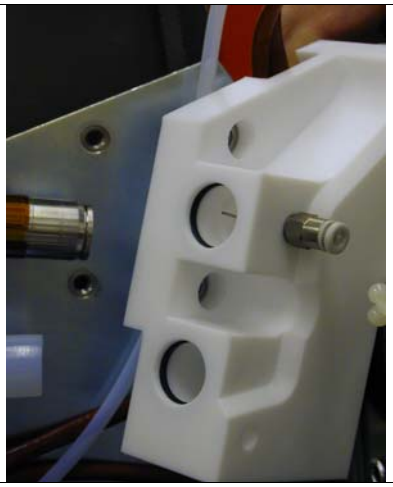
Tools required: Allen keys
Spanners

Parts required: PTFE Nebuliser Chamber (#PL0890-0490)

Ensure that the detector has cooled down before proceeding

Ensure that all gas and solvent connections are disconnected prior to proceeding

Open the detector and remove the front panel as described in *"Removing the front panel"*(pg 15).	
Remove the nebuliser heater assembly as described in *"Replacing the nebuliser heater assembly"*(pg 22). The nebuliser and heater assembly can be removed as one section, as shown in diagram	

Disconnect the black tubing to the nebuliser chamber. Using Allen keys, remove the two screws connecting the nebuliser chamber to the side-panel (be sure to support the nebuliser chamber)	
Whilst holding the nebuliser chamber, carefully remove the drain tube from the nebuliser chamber	
Carefully pull the evaporator tube and drain tube out of the nebuliser chamber, as shown, Replace with the new chamber and re-connect the gas tubing.	

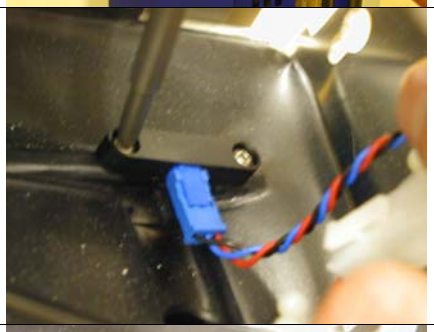
Ensure that the earthing cable is connected to the nebuliser heater assembly before switching on the instrument

Replacing The Solvent Leak Assembly

When required: Faulty Solvent leak sensor assembly

Tools required: Allen Keys
Spanners
Screwdriver

Parts required: Leak Sensor Assembly (# 0860-0395)

Open the detector's side panel using the access key, as shown.	
Ensure there is no liquid in the leak sensor well (located underneath the nebuliser chamber). Dry with tissue if necessary. Remove the two screws on the leak sensor assembly	
Disconnect the cable that connects the leak sensor assembly to the main control board. Replace the leak sensor assembly and reconnect the cable. If necessary replace the leak sensor cable assembly.	

Replacing The Vapour Sensors

When required: Faulty Vapour sensor(s)

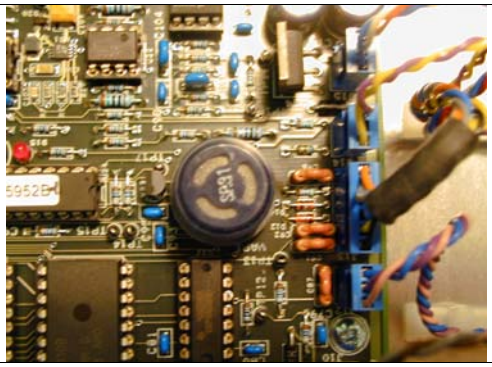
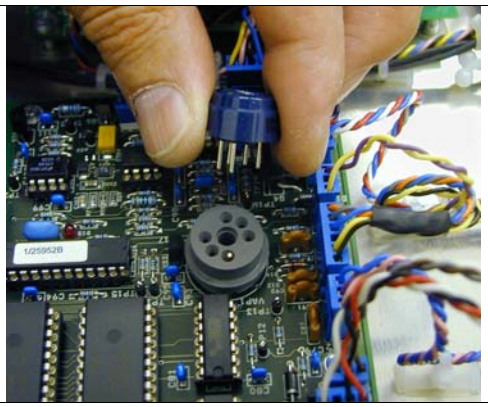
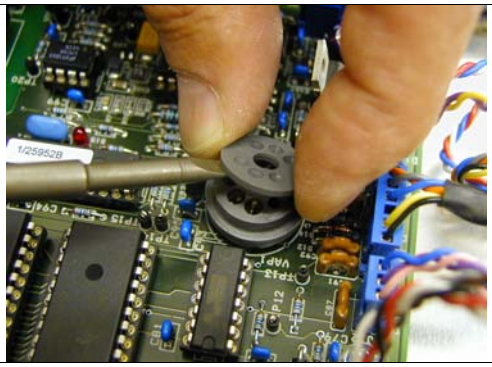
Tools required: Access key
Small screwdriver

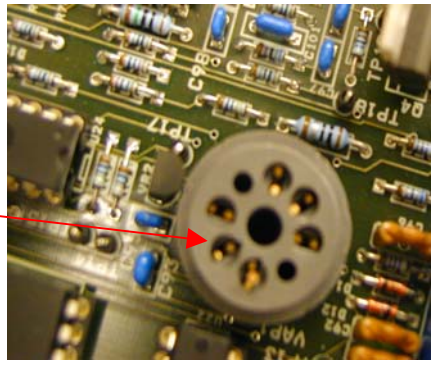
Parts required Vapour Sensor (# PL0890-0510)

NOTE

The Varian ELSD is fitted with a differential vapour sensor system. The external sensor is located at the rear of the instrument; the internal sensor is located on the main control board

Open the detector's side panel using the access key, as shown.	
Locate the external vapour sensor on the rear of the instrument.	

Carefully remove the sensor by unplugging the sensor from the back of the instrument.	
The internal vapour sensor is located on the main PCB, as shown.	
Carefully remove the sensor by unplugging the sensor from the main board as shown.	
Once the vapour sensor has been removed, check that the locating pins are not damaged by removing the cover as shown.	

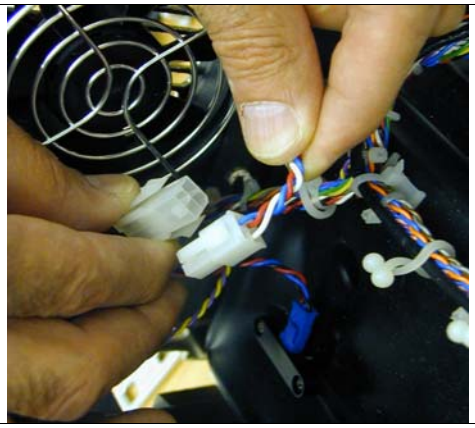
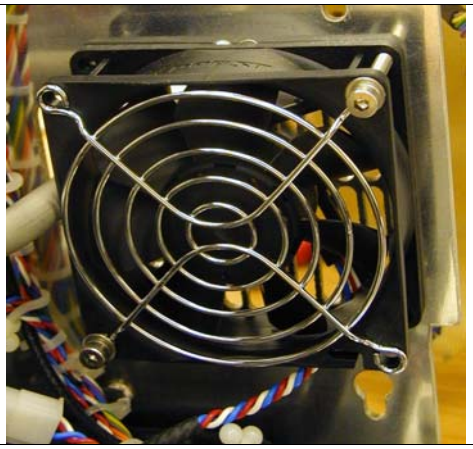
Ensure that the copper pins in each hole are close together, to ensure a good contact will be made with the replacement sensor's pins. If necessary move the pins with a small screwdriver.	

Replacing The Fan Assembly

When required: When faulty or noisy

Tools required: Allen keys

Parts required: Fan Assembly (#PL0890-0415)

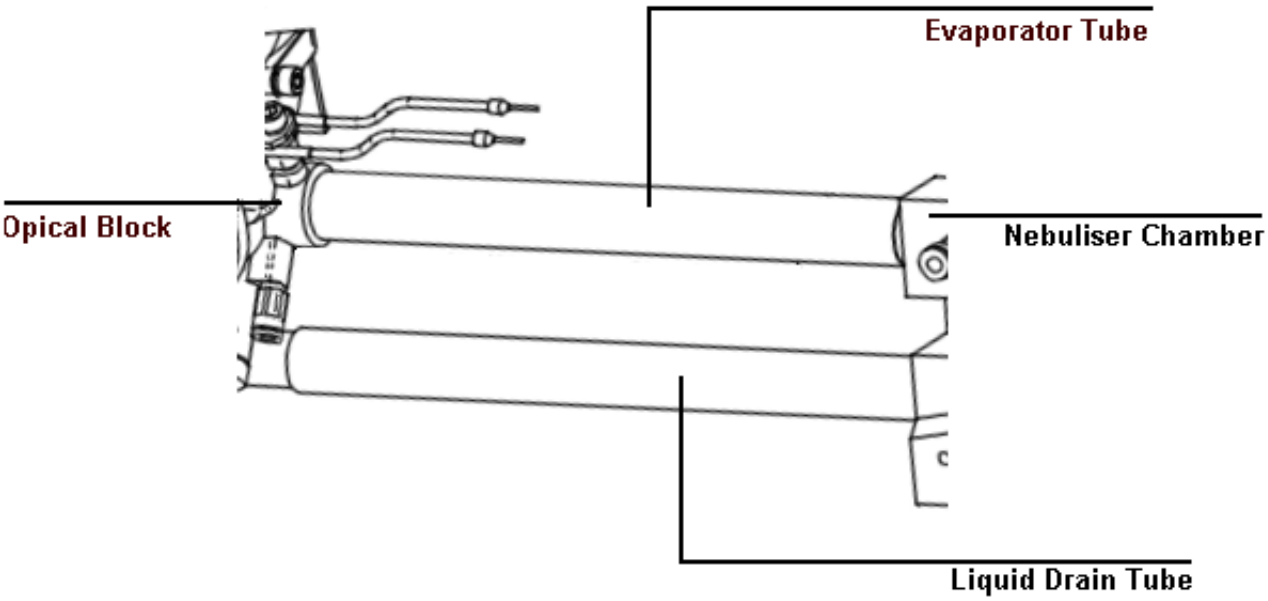
Open the detector's side panel using the access key, as shown.	
Disconnect the fan cable as shown (FAN).	
Remove the two screws of the fan assembly. For the 380-LC Insert the replacement fan with airflow from the back to the front.of the unit (i.e the silver label is not visible) Connect the fan cable to the main control board	

Remove the two screws of the fan assembly. For the 385-LC Insert the replacement fan with airflow from the front to the back.of the unit (i.e the silver label is visible, as shown) Connect the fan cable to the main control board	

The fan assembly on the Varian 385-LC must be installed in the opposite direction to the 380-LC, as shown, to prevent the power supply overheating

Overview of Varian 380-LC Evaporator Assembly

The Varian 380-LC evaporator assembly comprises a heated tube and drain tube, connecting the nebuliser chamber to the optical assembly (as shown). This section of the instrument also contains the Mass flow controller and gas valve. Access to this part of the instrument can be gained by opening the side panel, but the front panel may need removing for certain service operations.



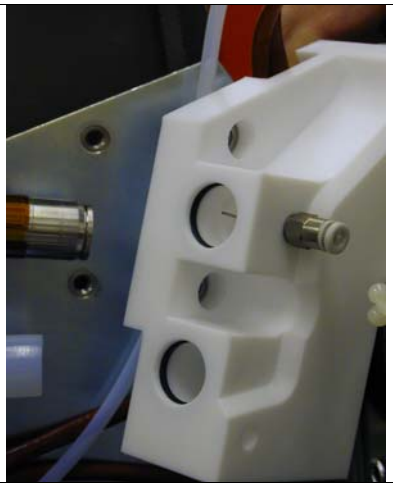
Removing And Cleaning The Evaporator Cartridge (Diffuser)

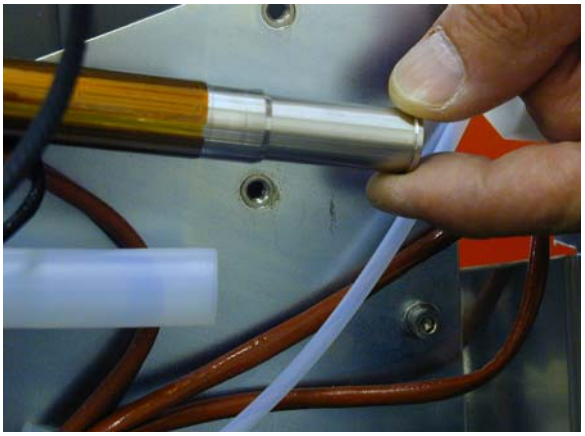
When required: Loss or reduction in sensitivity. Noisy Baseline

Tools required: Allen Keys

Parts required: Evaporator Cartridge (# PL0890-0475)

Ensure that the detector has cooled down before proceeding

Open the detector's side panel using the access key, as shown.	
Remove the nebuliser chamber as described in *"Replacing the nebuliser chamber"*(pg 24).	

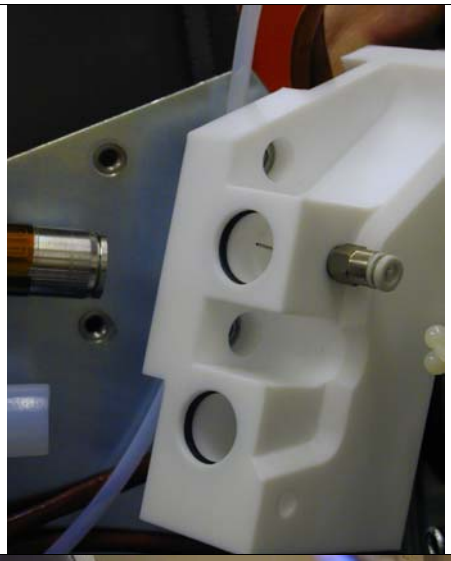
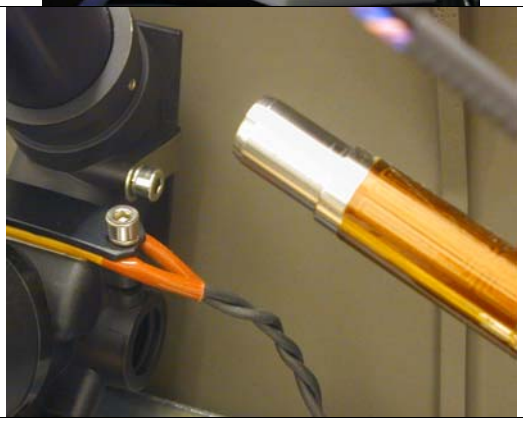
Remove the evaporator cartridge from the end of the evaporation tube as shown. Place the evaporation cartridge in a beaker of dilute acid and sonicate for *ca*.30 mins Rinse the evaporator cartridge with water then acetone. Replace the cartridge into the evaporator tube.	

Replacing The Evaporator Heater Assembly (Evaporation Tube)

When required: Faulty Heater / Evaporation tube become irreversibly contaminated

Tools required: Allen keys
Spanner

Parts required: Evaporator Heater Assembly (No Cartridge) (# PL0890-0480)

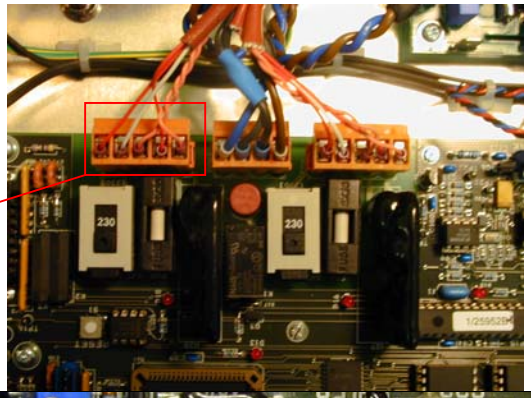
Open the detector's side panel using the access key, as shown.	
Remove the evaporator tube from the nebuliser chamber as described in "*Replacing the nebuliser chamber*" (pg 24) Do not discard evaporator cartridge.	
Carefully remove the opposite end of the evaporator tube from the optical block assembly.	

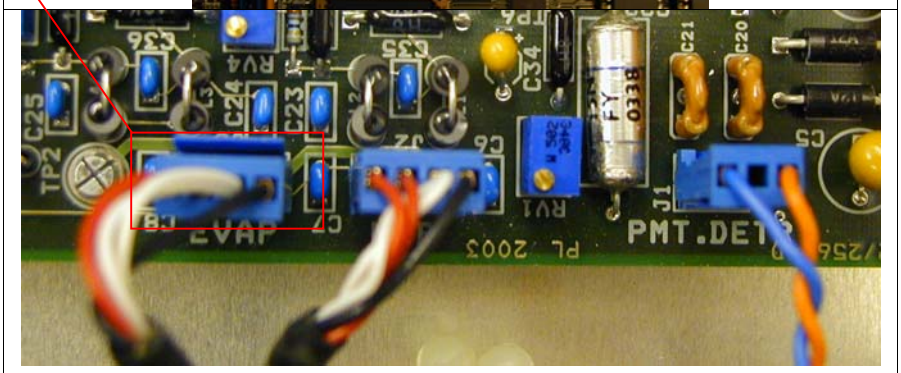
Disconnect the two Evaporator Heater Assembly cables from the main control board (EVAP.HTR & EVAP) and remove the evaporator heater assembly.

Insert the New Evaporator Heater Assembly into the optical block.

Insert the Cartridge into the Evaporator heater assembly and insert assembly into the nebuliser chamber.

Connect cables (EVAP.HTR & EVAP) to main control board





NOTE

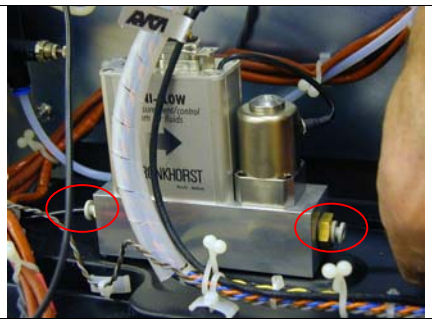
Ensure the evaporator cartridge is inserted into the evaporator assembly prior to reassembly; otherwise the instrument will not perform correctly

Replacing The Mass Flow Controller

When required: Faulty Mass Flow controller

Tools required: Allen Keys

Parts required: Mass-Flow Controller (# PL0890-0400)

Open the detector's side panel using the access key.	
Unplug the two black gas lines from either end of the Mass flow controller.	
Disconnect the Mass flow controller cable from the top the MFC.	
Remove the four screws, located underneath the base of the instrument, to remove the mass flow controller assembly. Insert the replacement mass-flow controller and reconnect the gas lines and control cable.	

Replacing The Gas Inlet Plug Assembly

When required: Every 12 months, or when filter becomes blocked

Tools required: Spanner

Parts required: Gas Inlet assembly (#PL0890-0425)

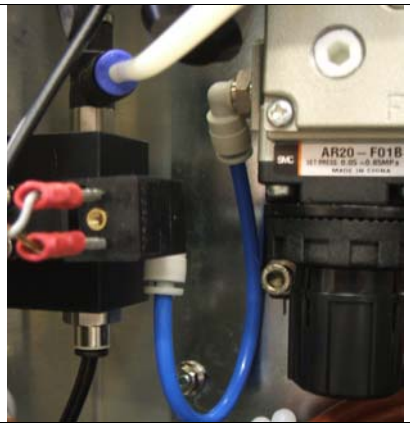
The gas inlet plug assembly is located at the rear of instrument, as shown	
Using a spanner, unscrew the assembly and remove as shown.	

Replacing The Gas Inlet Assembly

When required: Faulty Gas Inlet Valve

Tools required: Spanner

Parts required: Gas Inlet Assembly (#PL0890-0425)
Gas inlet Frit, 10µm (#PL0890-0525)

Open the detector's side panel using the access key as shown	
Locate the gas valve (as shown) and disconnect the red crimp connectors and all gas tubing.	
Locate the gas inlet plug assembly as shown and peel off the sticker to reveal two screws, which hold the valve in place.	

Remove the two screws to take out and replace the gas valve.	

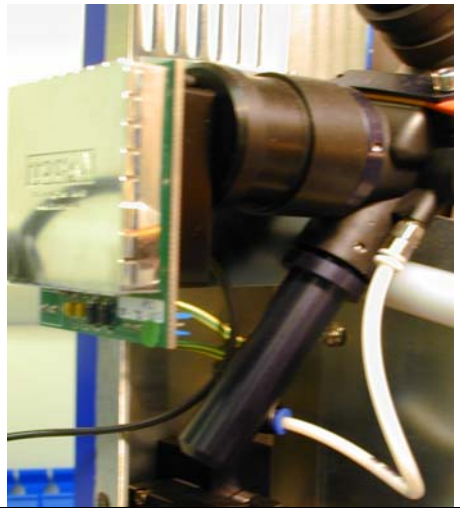
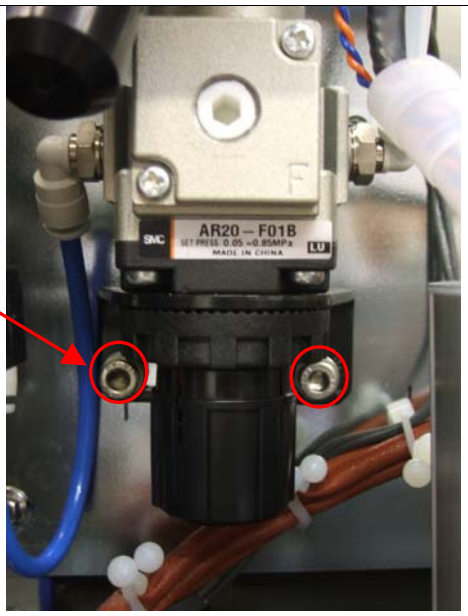
Replacing The Nebuliser Gas Regulator

When required: Faulty gas regulator

Tools required: Allen keys

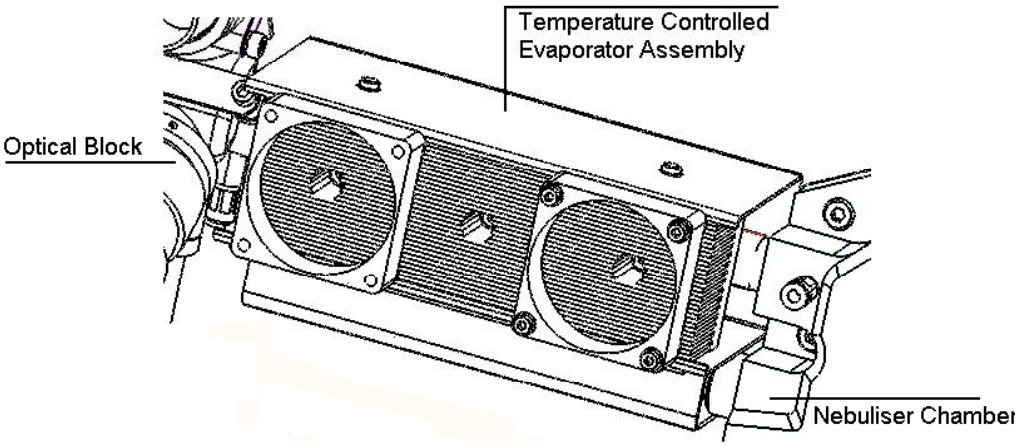
Parts required: AR20 Regulator Assembly (#PL0890-0430)

Open the detector's side panel using the access key as shown. Disconnect the gas supply to the instrument	
Locate the nebuliser gas regulator, situated behind the optical assembly, as shown.	

Remove the light trap, to allow easier access to the regulator. See section *"Replacing the Optical light trap"* (pg 59) for details of how to remove the light trap	
In order to remove the regulator, undo these two screws. Detach all gas lines into the regulator and extract the regulator Insert the new regulator, re-fasten the screws, reconnect the gas tubing and re-attach the light trap Follow the procedure outlined in "*Installing the nebuliser" (pg 20)* in order to configure the correct gas flow to the nebuliser	

Overview of Varian 385-LC Evaporator Assembly

The evaporator assembly of the Varian 385-LC comprises a temperature controlled evaporator tube section (Peltier unit) that provides active cooling and heating to the evaporator tube. A drain tube connecting the nebuliser chamber to the optical assembly diverts condensed vapour out through the front of the instrument.. This central section of the instrument also contains the mass flow controller and gas valve, which are identical to the 380-LC model



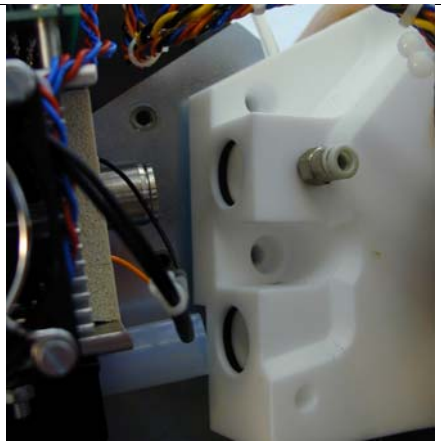
Removing And Cleaning The Varian 385-LC Evaporator Cartridge (Diffuser)

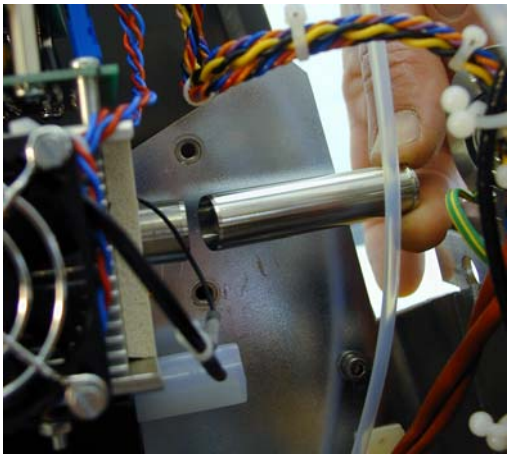
When required: Loss or reduction in sensitivity. Noisy Baseline

Tools required: Allen Keys

Parts required: Evaporator Cartridge (# PL0890-0475)

Ensure that the detector has cooled down before proceeding

Open the detector's side panel using the access key, as shown.	
Remove the nebuliser chamber as described in *"Replacing the nebuliser chamber"*(pg 24).	

Remove the evaporator cartridge from the end of the evaporation tube as shown. Place the evaporation cartridge in a beaker of dilute acid and sonicate for *ca*.30 mins Rinse the evaporator cartridge with water then acetone. Replace the cartridge into the evaporator tube.	

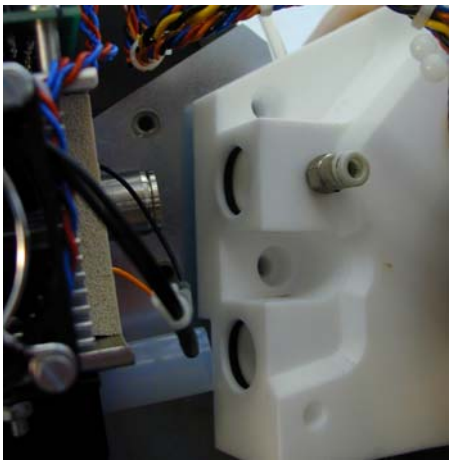
Replacing The Varian 385-LC Cooled Evaporator Assembly

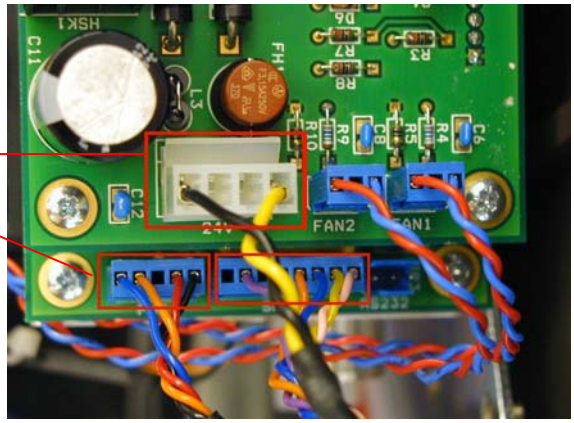
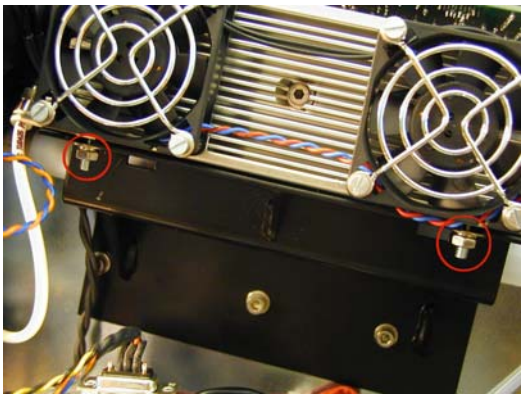
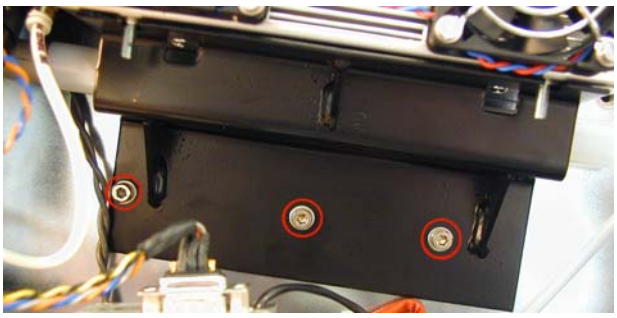
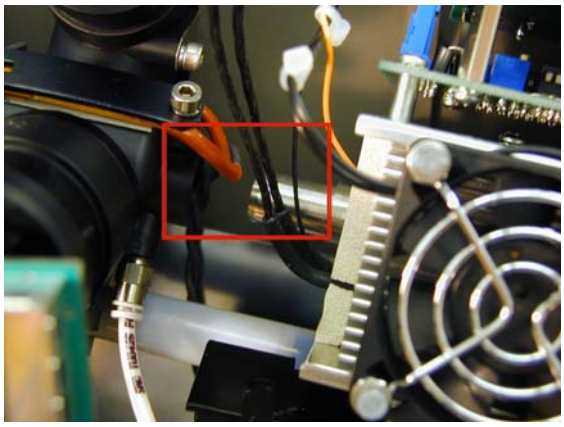
When required: Failure or damage to the Evaporator Heater Assembly / Evaporation tube become irreversibly contaminated

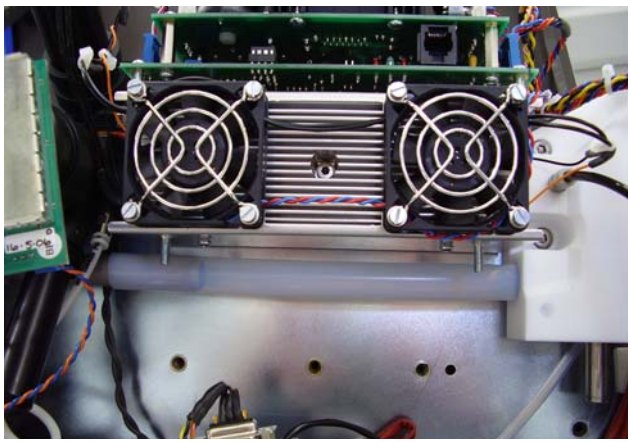
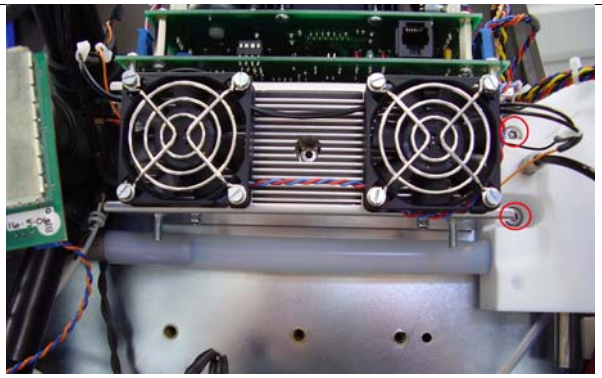
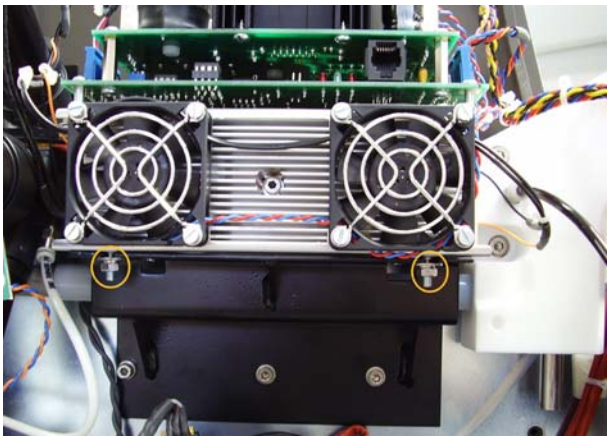
Tools required: Allen keys
Spanner

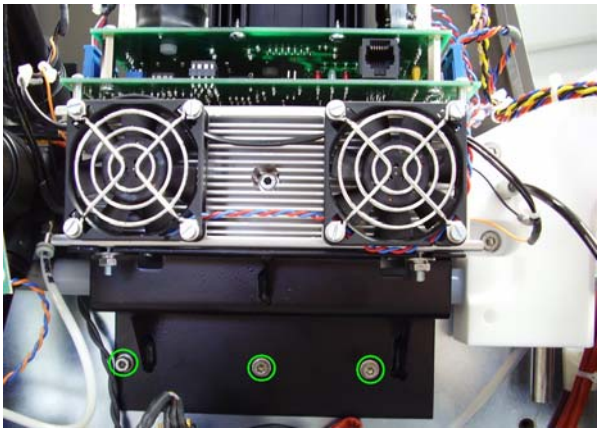
Parts required: Varian 385-LC Peltier Assembly (#PL0890-0630)

If this procedure is not followed correctly, the cooled evaporator assembly may be damaged

Open the detector's side panel using the access key, as shown.	
Remove the evaporator tube from the nebuliser chamber as described in "*Replacing the nebuliser chamber*" (pg 24) Do not discard evaporator cartridge.	

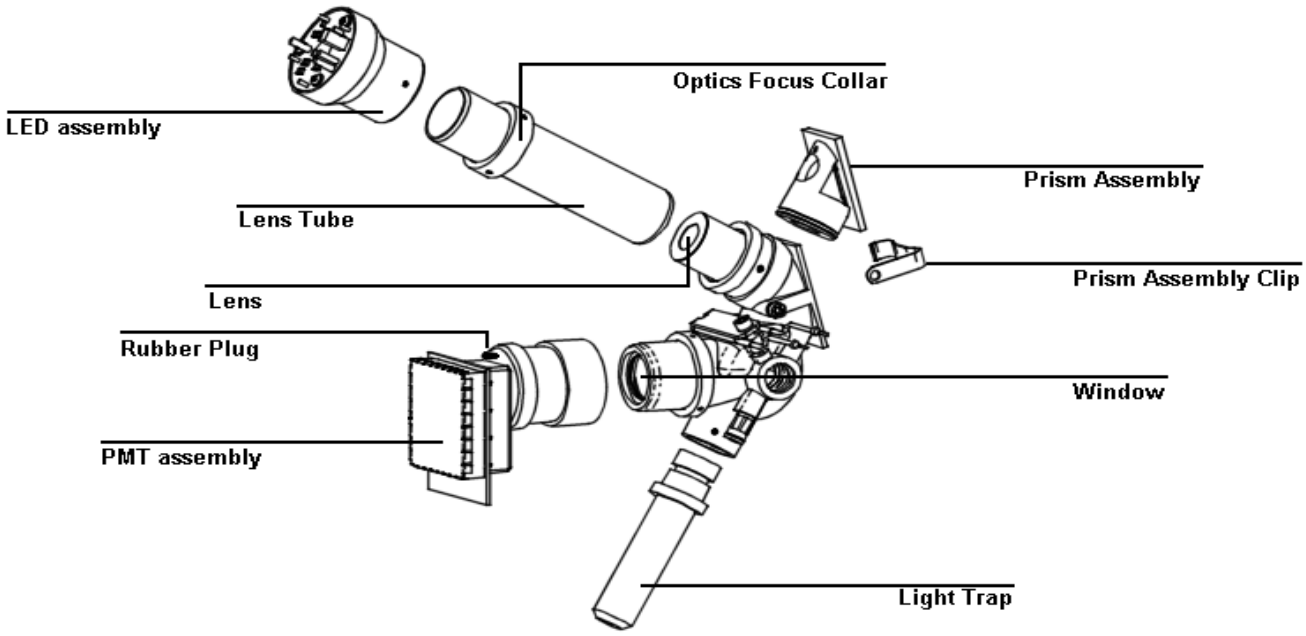
Disconnect the following connectors from the cooled evaporator assembly	
Carefully remove the evaporator assembly from the mounting bracket, by unscrewing the two nuts (shown in red)	
Support the evaporator assembly and remove the mounting bracket by the three screws, as shown.	
The evaporator assembly can now be removed from the optical block, as shown. Be careful not to exert excess force on the optical block, or evaporator assembly.	

To replace the cooled evaporator assembly carefully connect the ends of evaporator tube into the optical block and nebuliser chamber, as shown. Reconnect the electrical and gas connections DO NOT TIGHTEN ANY SCREWS AT THIS POINT AS THIS CAN DAMAGE THE ASSEMBLY	
Having positioned the evaporator assembly, tighten the nebuliser chamber screws. (shown in red) This will lock the ends of the assembly into position and guarantee the alignment is correct.	
Position the mounting bracket underneath the evaporator assembly. Whilst pushing the bracket and evaporator assembly backwards, towards the side wall of the ELSD, tighten the evaporator assembly screws, (shown in yellow). This will lock the position of the assembly to the bracket and prevent rotation of the assembly.	

Finally, tighten the bracket to the sidewall of the ELSD, using the screws highlighted in green.	

Overview of Optical Assembly

The optical assembly of the Varian ELSD has been designed for easy maintenance; however there may be occasions where the optical surfaces need cleaning. The diagram below shows the major components of the optical assembly



Removing The Photodetector (PMT) Assembly

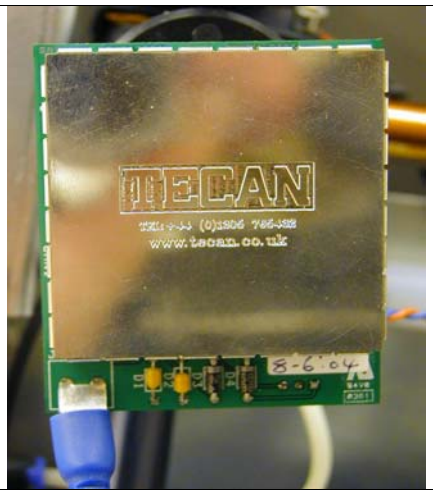
When required: Faulty photomultiplier

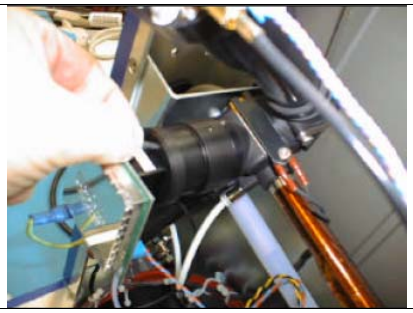
Tools required: Allen keys
Lint-free optical lens tissue

Parts required: Photo Detector Assembly (# PL0890-0405)

ATTENTION

Electronic boards and components are sensitive to electronic discharge (ESD). In order to prevent damage always use ESD protection when handling electronic boards and components.

Open the detector's side panel using the access key, as shown.	
Locate the PMT module on the optical assembly, as shown.	

Disconnect all 3 cables from the PMT assembly.	
Loosen the grub screw on the PMT assembly and remove the black rubber plug, as shown.	
Carefully remove the PMT assembly from the optical block. Attach the replacement PMT assembly making sure all three cables are re-connected. Tighten the Grub screw and re-insert the black rubber plug.	

The rubber plug must be inserted into the PMT assembly, otherwise the detector will not perform correctly.

Adjusting Photodetector (PMT) Sensitivity

When required: Following PMT or Nebuliser change

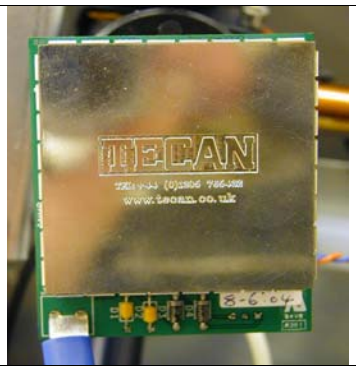
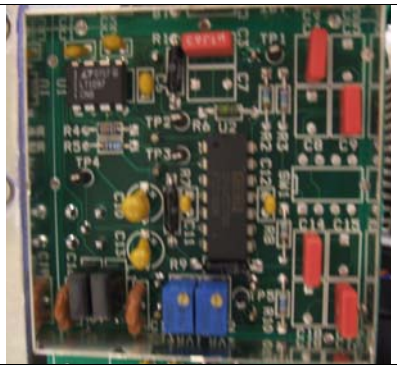
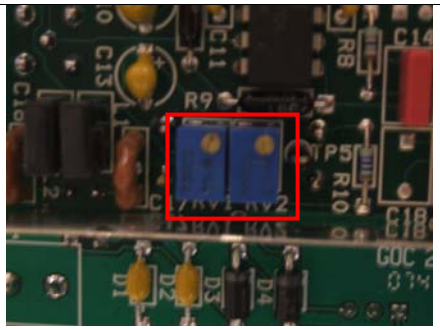
Tools required:

Parts required: IQ/OQ Manual

Glucose Test solution

ATTENTION

Electronic boards and components are sensitive to electronic discharge (ESD). In order to prevent damage always use ESD protection when handling electronic boards and components.

Switch on the ELSD and record the offset value displayed on the front screen Locate the PMT module on the optical assembly, as shown.	
Remove the cover of the PMT module to expose the internal PCB	
The PMT gain is adjusted by turning the screws on the two blue components. The right component is the coarse gain adjustment The left component is the fine gain adjustment	

To achieve the desired sensitivity, follow the IQ/OQ procedure and record the response obtained for glucose. If the ELSD does not achieve the specified glucose response then calculate the necessary offset value using the equation shown. The OFFSET value should not exceed 140mV.	$\left(\frac{\text{Original Offset}}{\text{Glucose Response (mV)}}\right)$ x Target Glucose resp

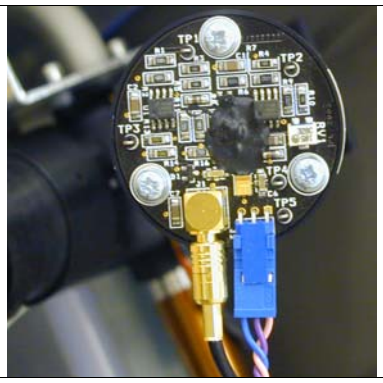
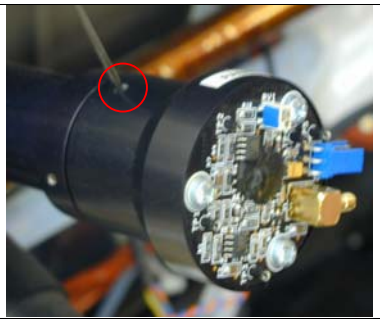
Replacing The LED Light Source Assembly

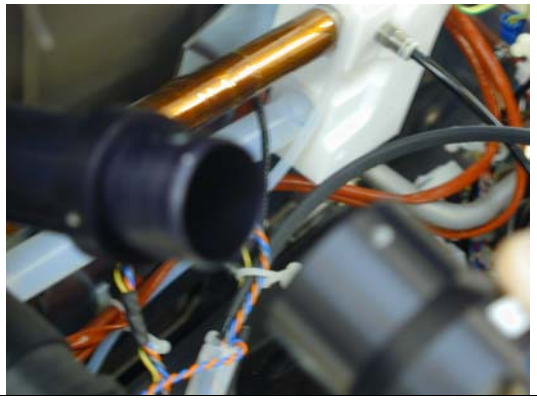
When required: Faulty LED

Tools required: Allen keys
Lint-free optical lens tissue

Parts required: ELSD Light Source (# PL0890-0410)

Eye damage may result from directly viewing the light produced by the LED used in this instrument. Always turn off the power supply before removing the light source

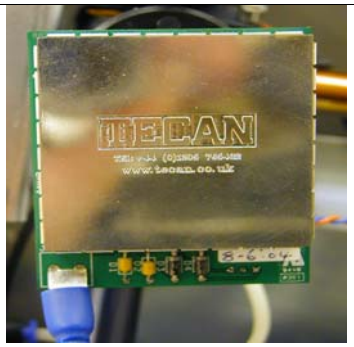
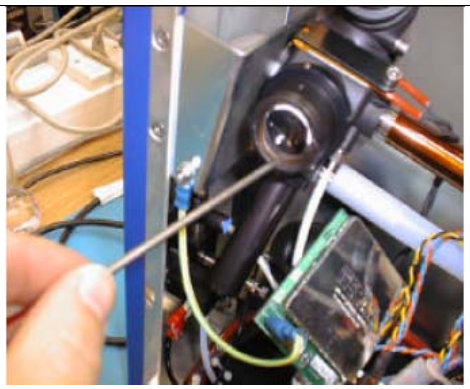
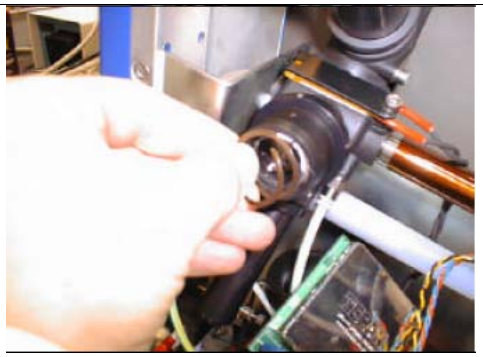
Open the detector's side panel using the access key, as shown.	
Disconnect the gold and blue connectors from the light source assembly	
Loosen the grub screw on the light source assembly	

Carefully remove the light source assembly. Attach the replacement light source assembly. Make sure the assembly is pushed up against the focusing collar. Re-connect the gold and blue connectors. Tighten the grub screw.	

Cleaning The Optical Lens Assembly

When required:	Contamination within the optical assembly (offset too high)
Tools required:	Allen keys Lint-free optical lens tissue
Parts required:	See factory for details on required parts

Open the detector and remove the front panel as described in *"Removing the front panel"*(pg 15). Loosen the grub screw shown to release the Light Source Lens Tube on the optical assembly	
Pull the Light Source Lens Tube out of the optical block.	
The Light Source Lens, 'O' ring and spacer are held in place by a Wave-Ring spring. Use a small screwdriver to release the spring (see later). Remove the lens for cleaning using lint free optical lens tissue. Refit the lens and reassemble referring to the optical assembly diagram to orientate the lens correctly.	

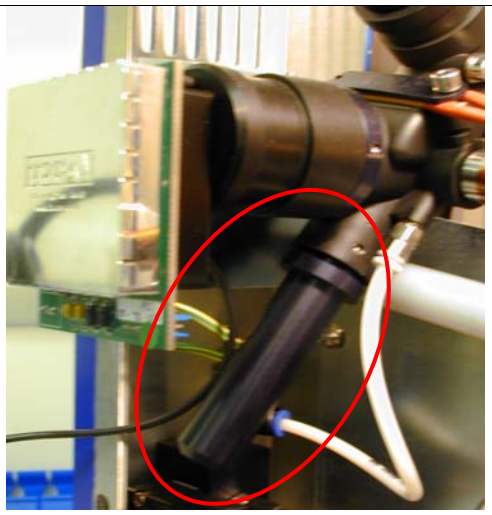
To clean the Photodetector (PMT) assembly, first remove the assembly as described in "*Removing the Photodetector (PMT) Assembly*" (pg 51)	
The lenses are held in place by a Wave-Ring spring (see below). Release the spring using a small screwdriver.	
The Wave-Ring spring can then be removed as shown. Remove and clean the lenses using lint free optical lens tissue. Reassemble referring to the optical assembly diagram to get the correct lens orientation.	

Replacing The Optical Light Trap

When required: High Baseline Offset; Noisy baseline

Tools required: Allen keys
Screwdriver

Parts required: Light Trap Assembly (#PL0890-0580)

Open the detector's side panel using the access key, as shown.	
The light trap is located behind the PMT module, as indicated.	

Using an Allen key, loosen the grub screw (as indicated) and carefully pull out the optical light trap as shown.	

Replacing The Optical Heater

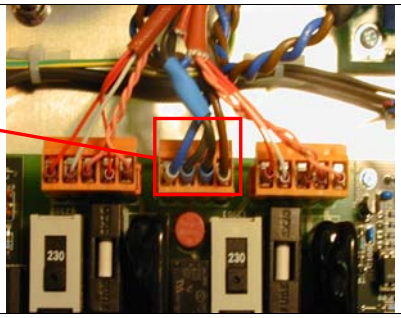
When required: Failure of optical heater or optical heater fuse

Tools required: Allen keys
Screwdriver

Parts required: Optics Heater (#PL0890-0595)

ATTENTION

Electronic boards and components are sensitive to electronic discharge (ESD). In order to prevent damage always use ESD protection when handling electronic boards and components.

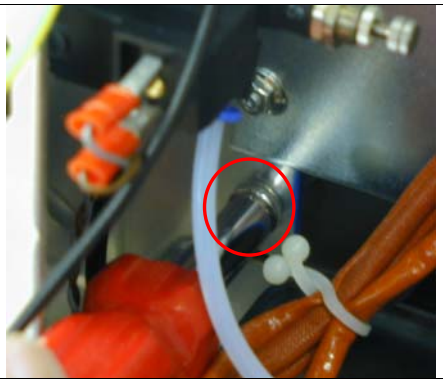
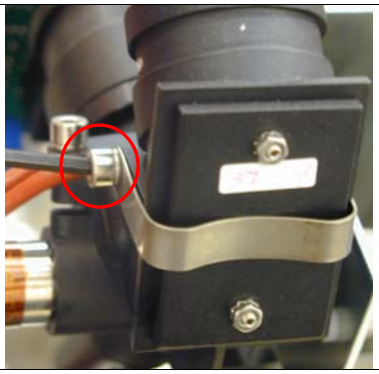
Open the detector's side panel using the access key, as shown.	
Using an Allen key remove the optics heater plate from the optical block assembly, as shown.	
Disconnect the optics heater cable (as highlighted) from the main PCB board. Replacement of the optics heater fuse (as highlighted) is also recommended when the heater is replaced.	

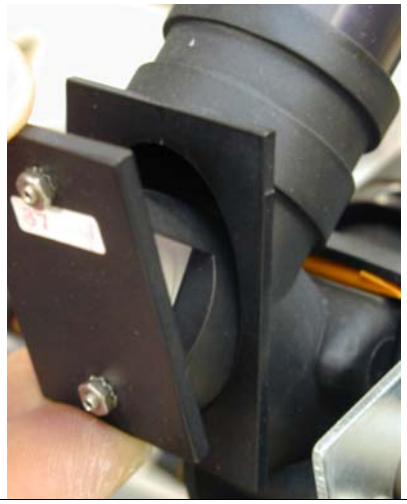
Removing & Cleaning The Prism Assembly

When required: Contaminated prism:- High baseline offset

Tools required: Allen keys
Lint-free optical lens tissue
Lens cleaner

Parts required: Prism assembly (#PL0890-0585)

Open the detector's side panel using the access key, as shown.	
Remove the two screws located at the bottom (as shown) and top of the inside panel. Remove the side panel to gain access the rear of the optical assembly	
Using an Allen key, undo the screw to remove the prism assembly clip, as shown	

Very carefully slide out the prism assembly from the optical assembly.	
The prism assembly can be replaced or cleaned using lint-free optical tissue and cleaner.	

Electronics

The electronics comprise three main components:

1. Detector's Main Control PCB
2. Power Supply
3. Cooled Evaporator assembly (Varian 385-LC only)

Replacing The Main Control PCB

When required: Defective Main Control PCB

Tools required: Screwdriver
Allen keys

Parts required: Varian 380 Main Control PCB (# PL0890-0470)
Varian 385 Main Control PCB (# PL0890-0515)

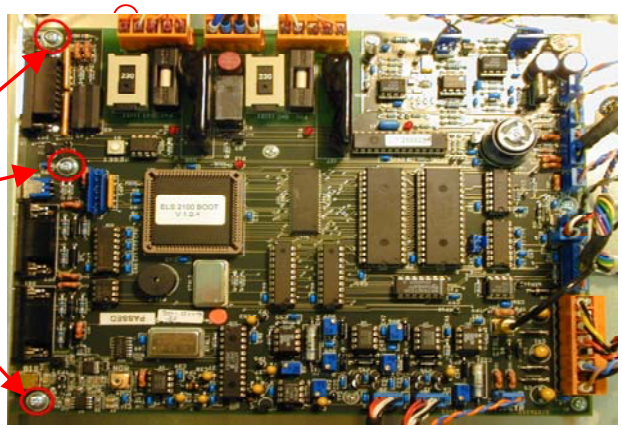
Heater PCB Fuses

There are 3 fuses fitted to the main control PCB, one to protect each of the heater circuits

FH 1 & FH 3: H 1A FF 250V
FH 2: TR5 2A T 250V

Electronic boards and components are sensitive to electronic discharge (ESD). In order to prevent damage always use ESD protection when handling electronic boards and components.

Open the detector's side panel using the access key.	

Remove the three screws, as indicated and unplug all connections.	
Remove the six screws from the rear of the instrument, as highlighted Carefully lift the board from its mountings. Replace the new PCB and re-connect all the cables Check Firmware on replacement board is correct version for ELSD model	

Replacing The Power Supply

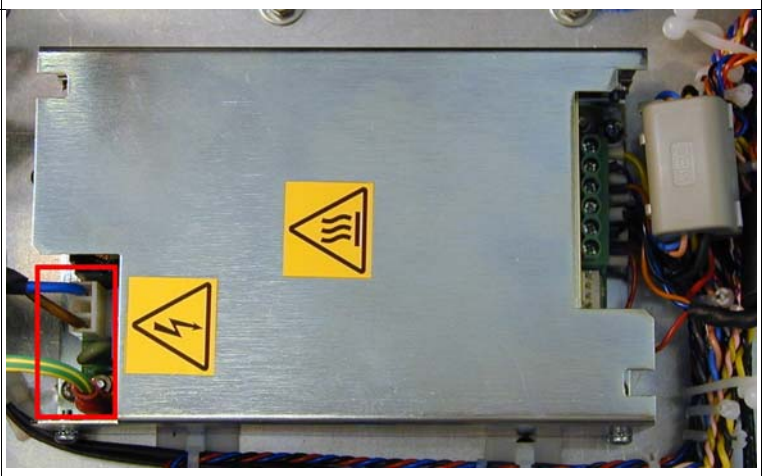
When required: Defective or Failed Power Supply

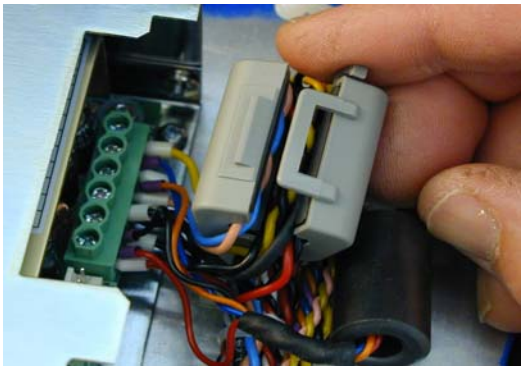
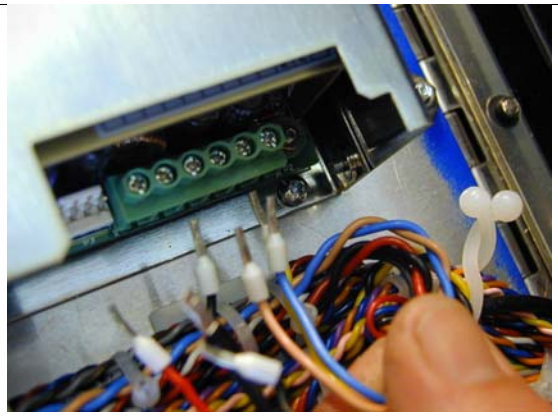
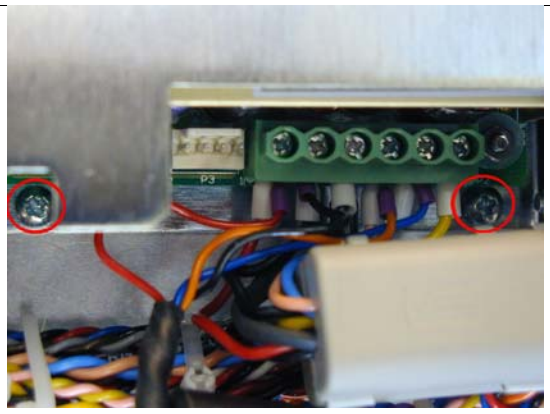
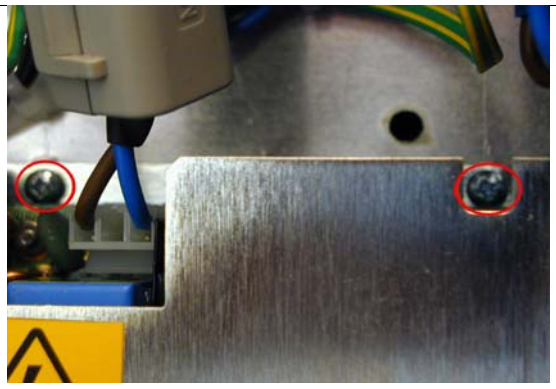
Tools required: Screwdriver
Allen Keys

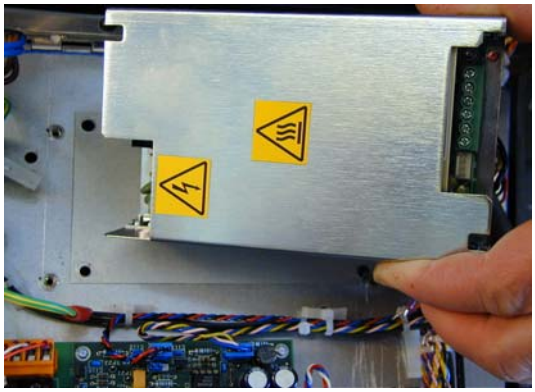
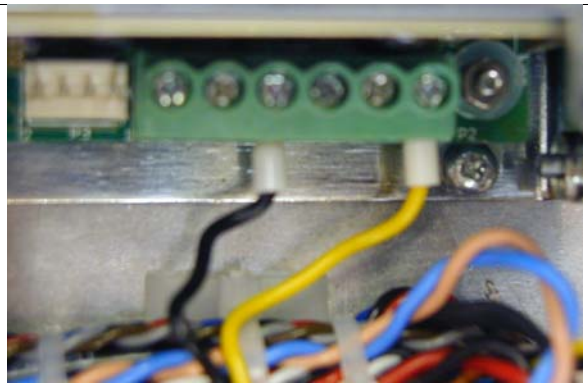
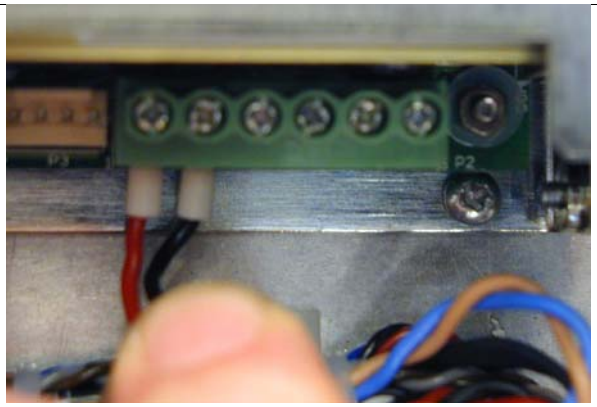
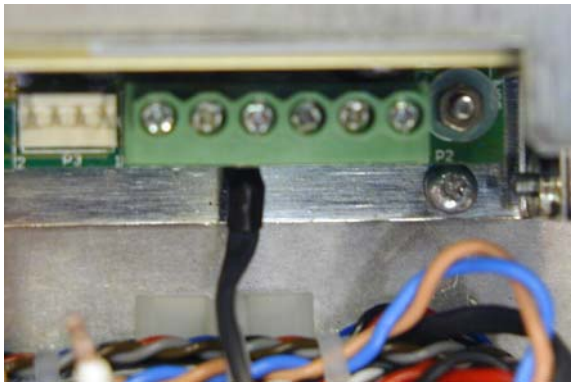
Parts required: Varian 380-LC Power Supply (# PL0890-0520)
Varian 385-LC Power Supply (# PL0890-0535)

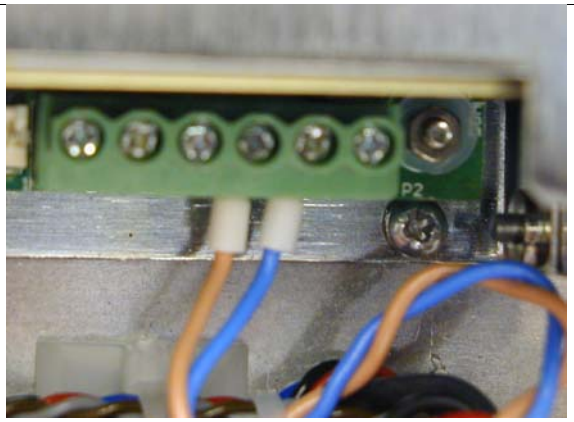
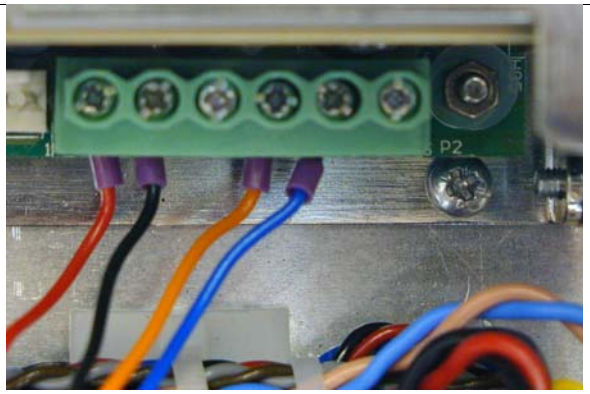
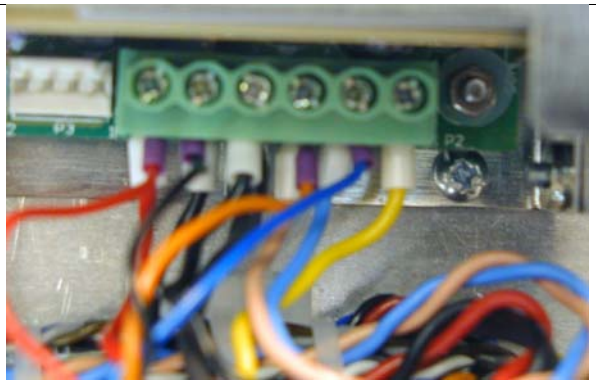
NOTE

Electronic boards and components are sensitive to electronic discharge (ESD). In order to prevent damage always use ESD protection when handling electronic boards and components.

Open the detector's side panel using the access key.	
Locate the power supply on the main PCB. Unplug the two connectors highlighted	

Remove the ferrite from the group of wires, as shown.	
Disconnect the wires from the power supply, as shown.	
Remove the power supply from its mounting by unscrewing the four screws, as shown.	
	

Remove the power supply.	
Insert the new power supply and re-connect the cables. Ensure the correct wires are connected to correct positions on the green terminal block. The pair of black & yellow wires connect as follows: Black position 3 Yellow position 6, as shown	
The pair of red & black wires connect as follows Red position 1 Black position 2	
The single black wire (screen) connects as follows: Large Black position 3.	

The pair of pink & blue wires connect as shown: Pink position 4. Blue position 5.	
The group of 4 wires connect as shown: Red position 1. Black position 2. Orange position 4. Blue position 5.	
When all of the wires are connected the green block should appear as shown.	

Firmware

The Varian 380-LC & 385-LC contain control firmware that can be flash upgraded, as described in section *"Upgrading Firmware".. (pg 65).*

The Varian 380-LC also contains additional firmware on the cooled evaporator assembly, to control the Peltier unit. This firmware can only be flash upgraded at the factory.

The current firmware versions (February 2008) are:

Varian 380-LC	v22.0.2
Varian 385-LC	v22.0.4

A 24bit (10Hz) digital output, via the serial port, is available with firmware versions >= 1.5.5.

Firmware versions 22.0.2 & 22.04 are not compatible with older ELS

Device Identifier

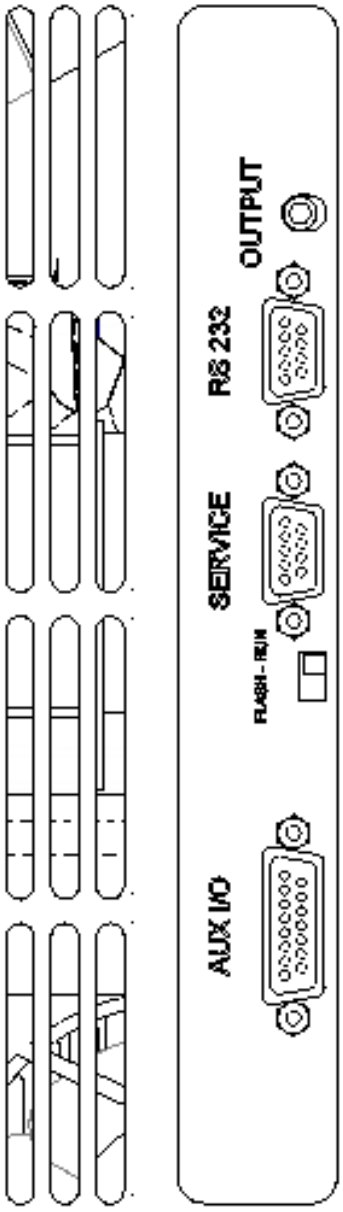
To allow the control of multiple ELS detectors from a single PC, Varian ELSDwith firmware versions >1.5.5 have programmable device identification. The default value is set at 1, with a maximum of 254.

The device identity can be configured as shown in section *"Programming Device Identity"*

Upgrading Firmware

Tools required: TERMINAL.exe or Hyperterminal.exe (supplied with Windows)
Varian ELSD firmware file (e.g. 9041_2204.HEX)
Serial cable (supplied with instrument)

Parts required: N/A



1. Close down the control software and turn off the instrument.

2. Close down any software currently connected to the unit and turn off the instrument.

3. At the rear of the detector move the switch, located below the serial connector, to the up position.

4. Run the HexTerm or Terminal.exe program.

5. Select the Varian ELS detector from the menu bar and the correct communication port.

6. Turn on the instrument and check that the message, “Bootloader v904211”, is shown.

7. Browse to select the new firmware (e.g., A:\9061_2204.hex).

8. Select the download icon, to upgrade the EPROM with the new firmware. During transfer, the auto-zero light on the detector front panel will turn red and flash

9. On successful completion of the programming, a message will appear and all three lights on the front panel will turn green.

10. Exit the HexTerm program and turn off the instrument.

11. On the back of the Varian ELS detector move the switch, located below the serial connector, to the down position.

12. Switch the detector back on and check the version of firmware in Galaxie™ by choosing the status option in the Varian ELS detector control window.

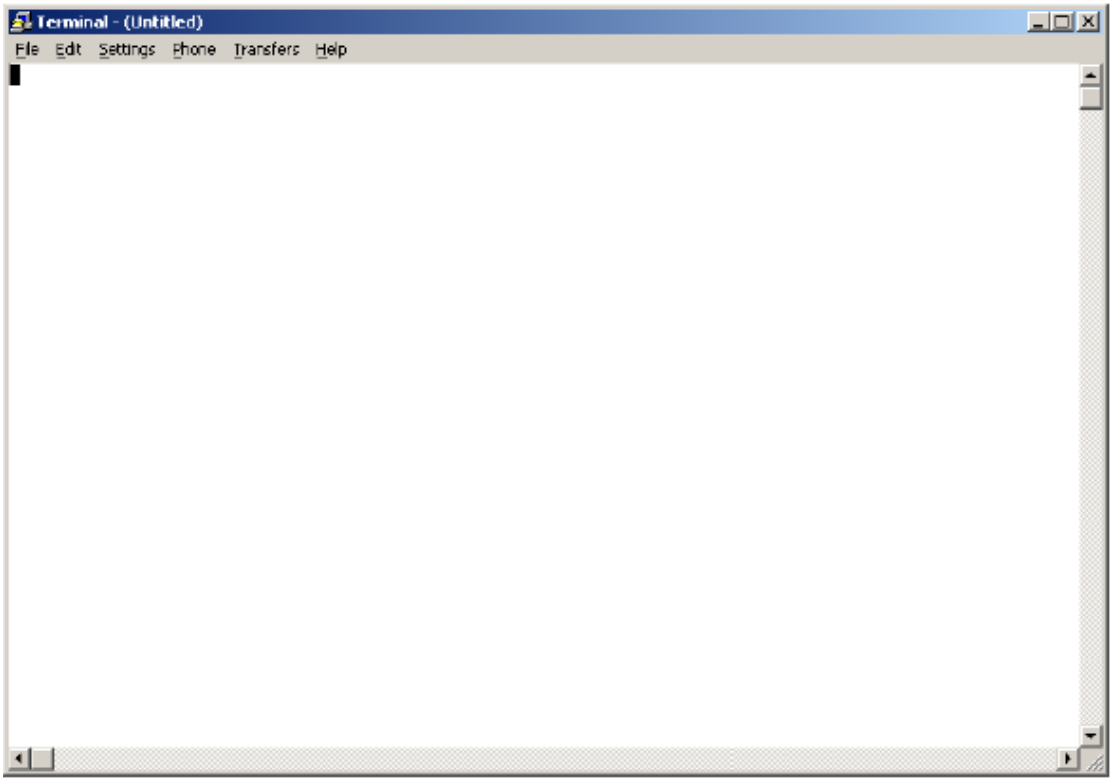


Figure 1 Terminal program

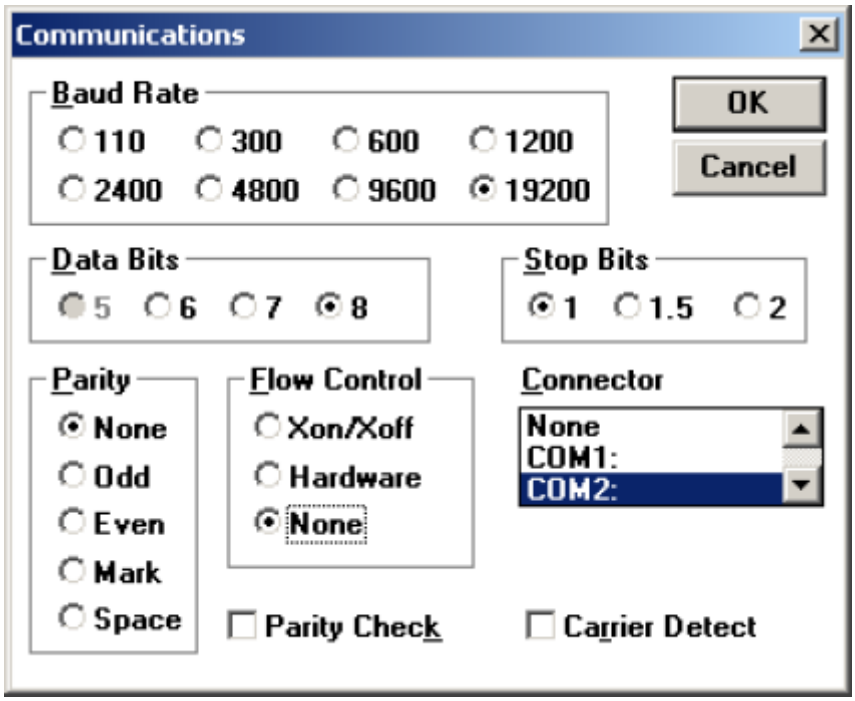


Figure 2 Communications dialog

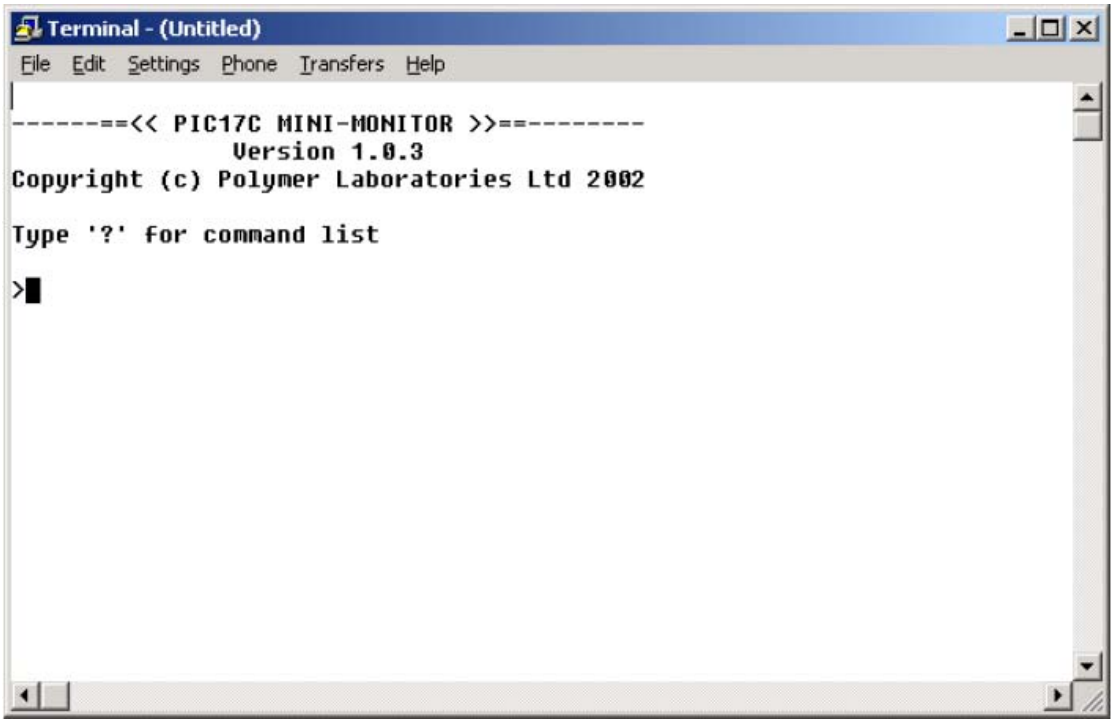


Figure 3 Successful Communications

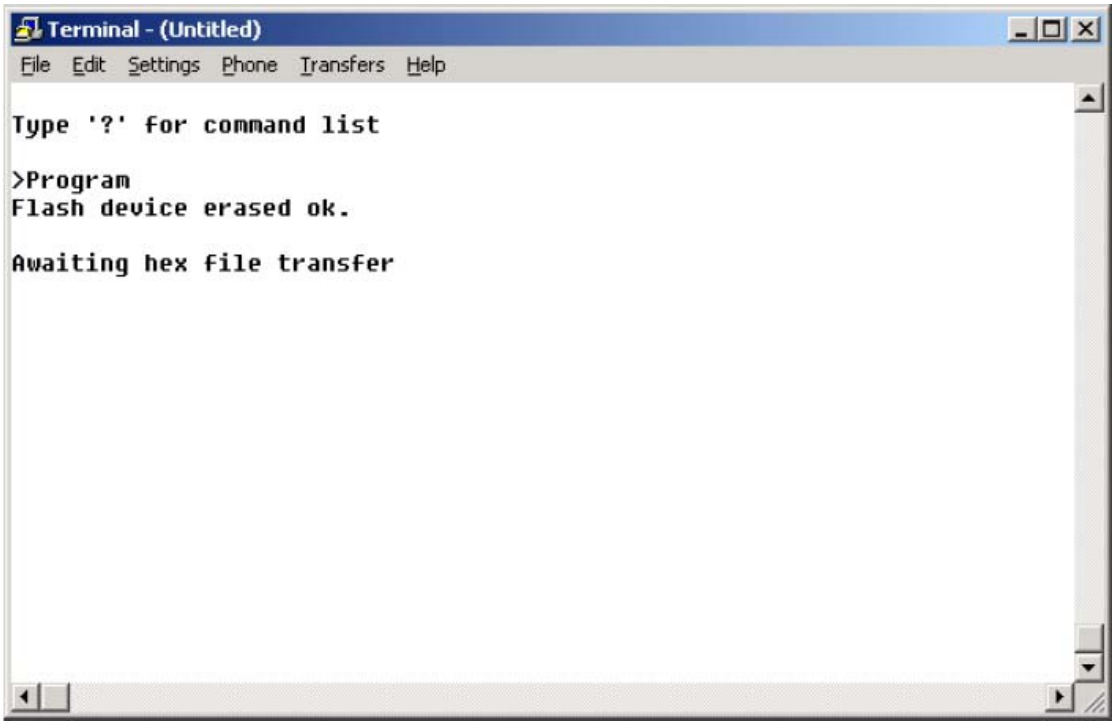


Figure 4 Initializing the Programming

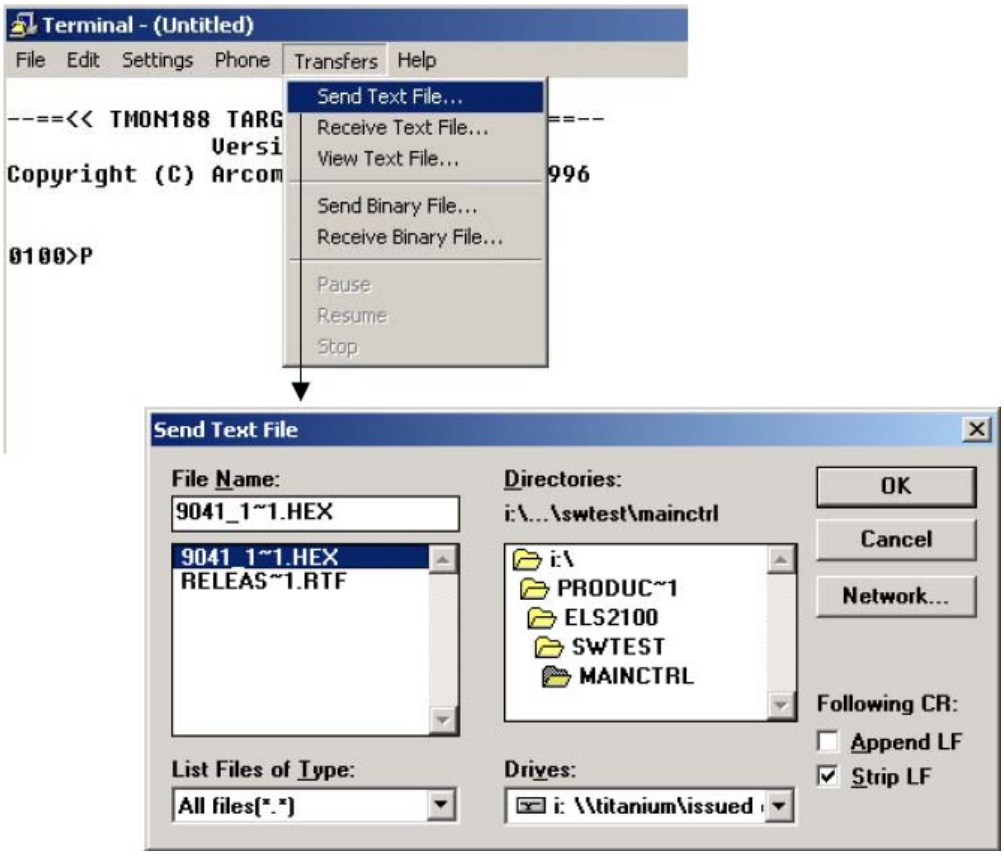


Figure 5 Selecting the HEX file

Figure 6 Downloading the Program

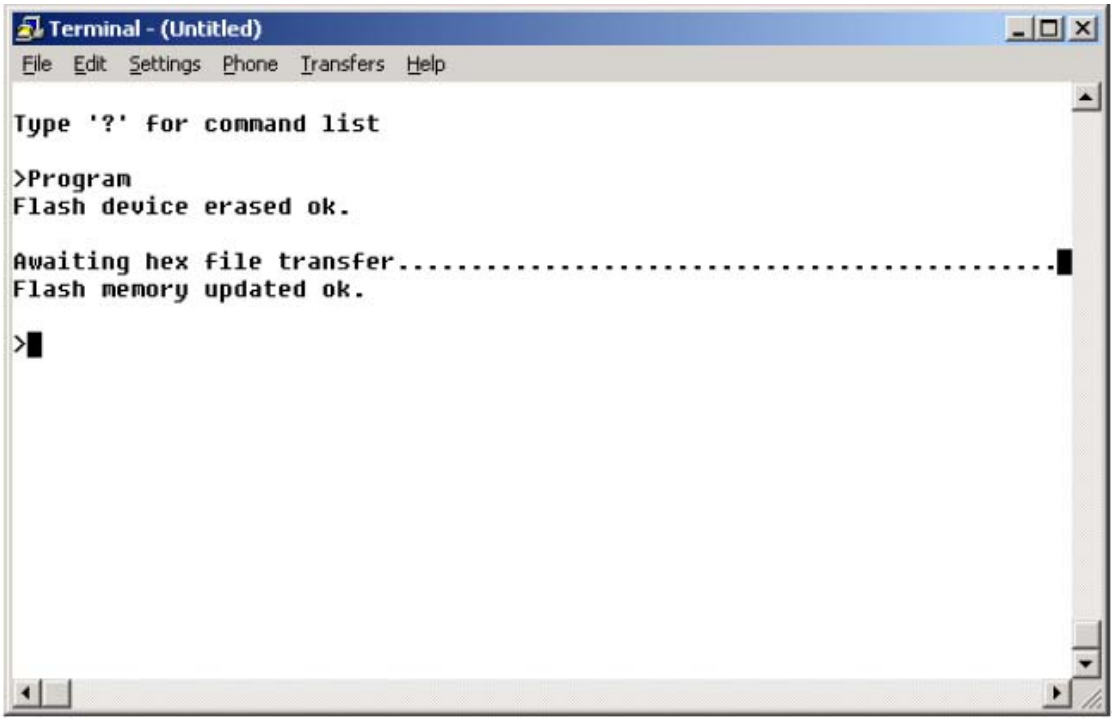
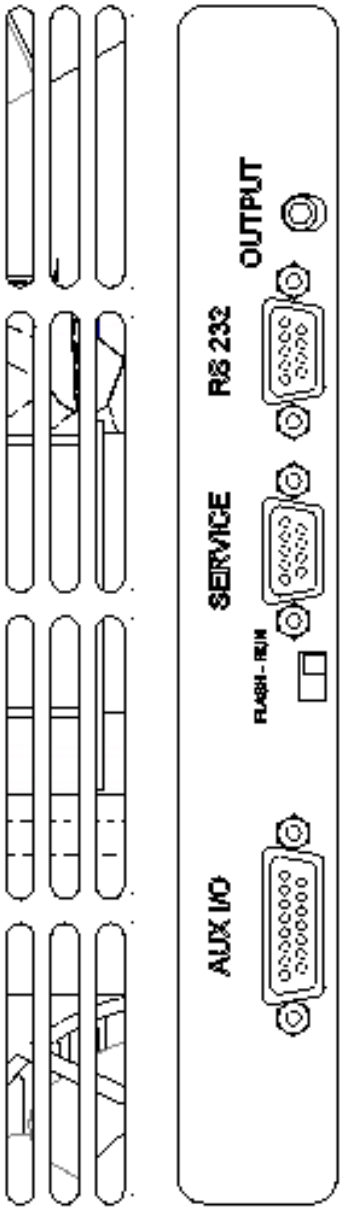


Figure 7 Programming the EPROM

Programming Device Identity

Tools required: TERMINAL.exe or Hyperterminal.exe (supplied with Windows)
ELSD Device ID.TRM program
Serial cable (supplied with instrument)

Parts required: N/A



1. Close down the control software

2. Connect the serial cable to the RS232 port on the rear of the instrument

3. Start the ELSD Device ID.TRM program (Figure 8) and configure the *Communications* in the *Settings* menu (figure 9)

4. Check the instrument successfully communicates with the terminal program by selecting *Get Data* (figure 10).

5. Now obtain the identity of the ELSD by selecting *GET ID*. The following value should be obtained *001B000000000XB6* ,where *X* is the device ID (figure 11)

6. To set the ELSD device ID to 1, select the *SET ID 1*

7. Check the device ID has been set to the correct value by selecting *GET ID.* The output should read "001B0000000001B6"

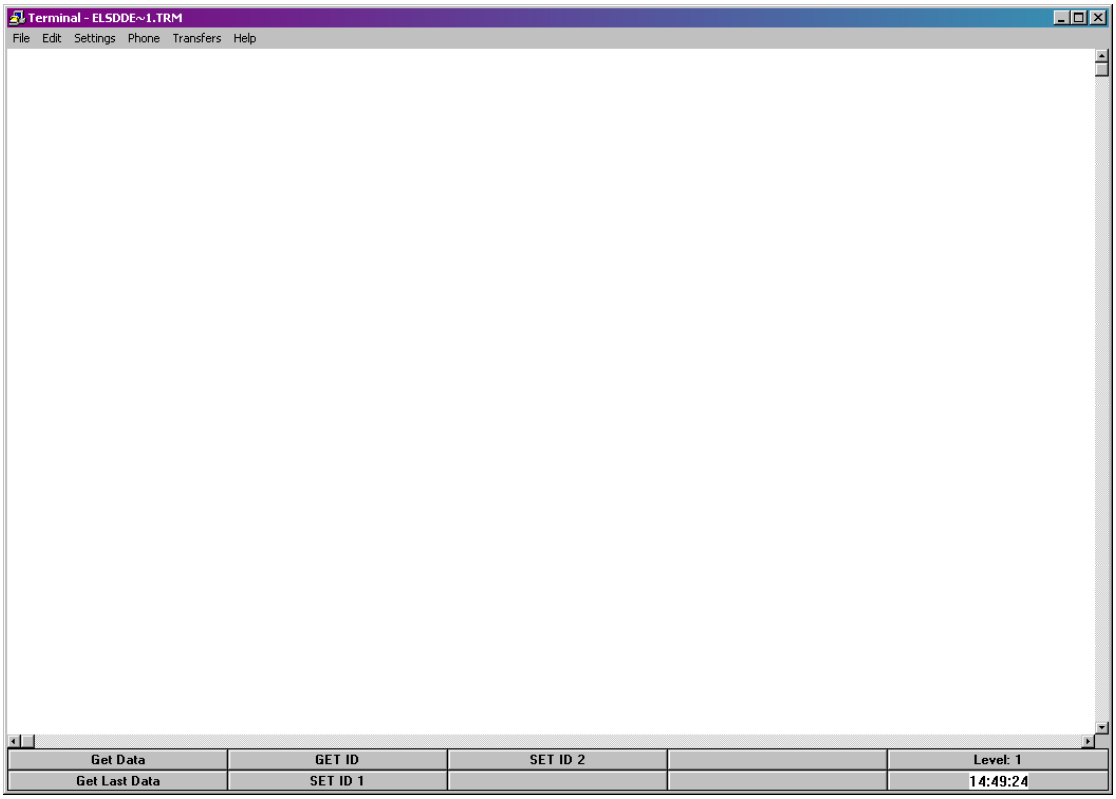


Figure 8 ELSD Device ID Terminal program

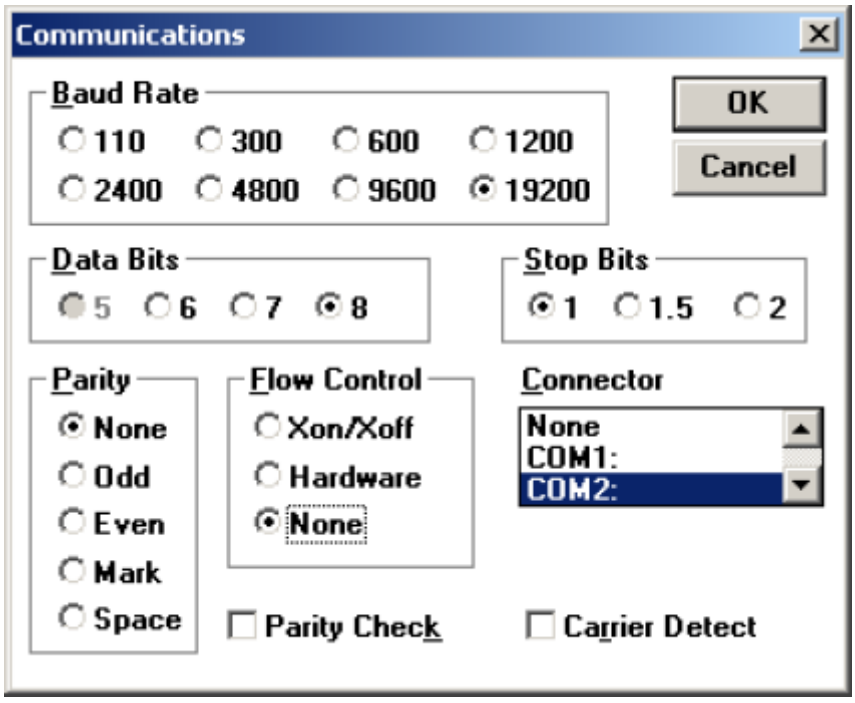


Figure 9 Communications dialog

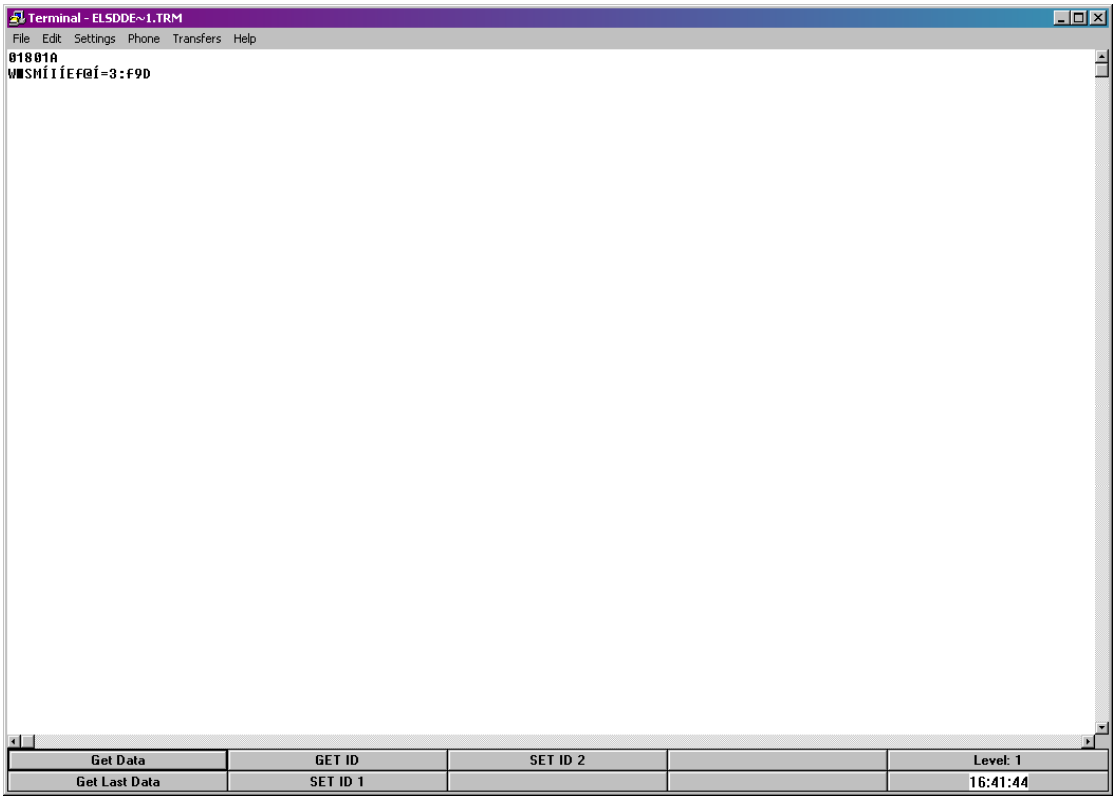


Figure 10 Successful Communication with Get Data command

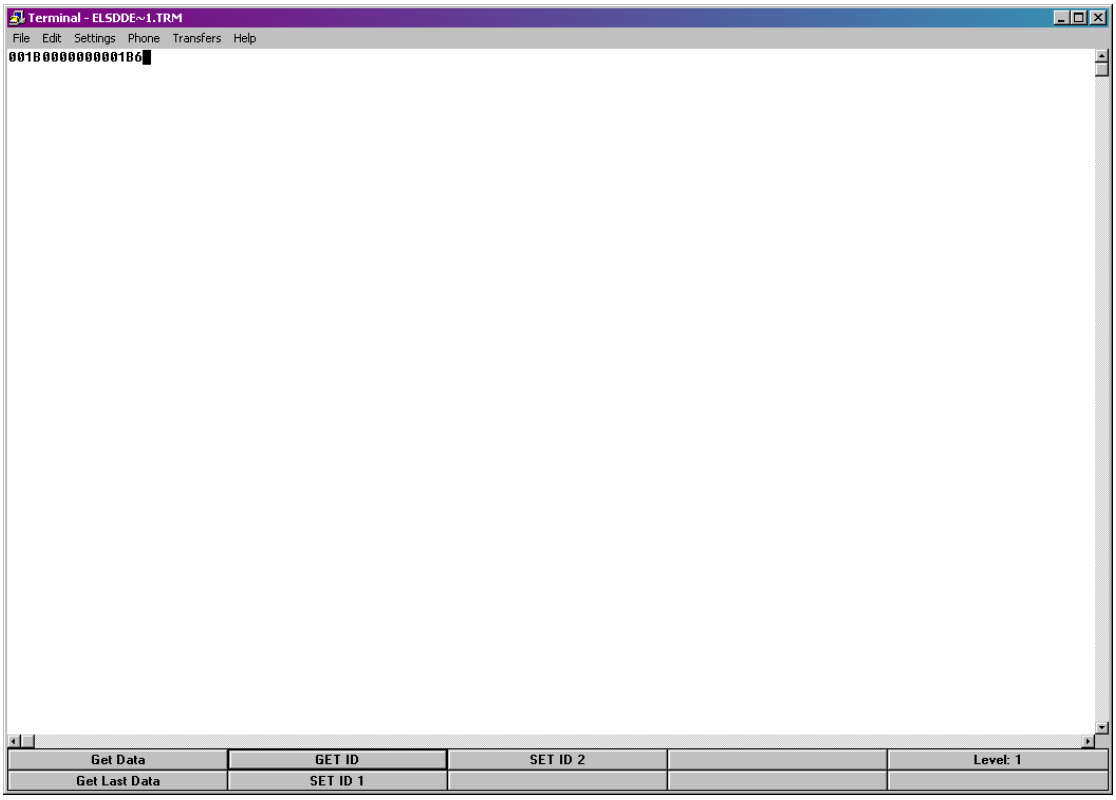


Figure 11 Device ID displayed

Description	Part No
380-LC Evaporative Light Scattering Detector (110v)	PL0890-0110
380-LC Evaporative Light Scattering Detector (240v)	PL0890-0240
385-LC Evaporative Light Scattering Detector (110v)	PL0890-1110
385-LC Evaporative Light Scattering Detector (240v)	PL0890-1240
Analogue Output Cable	PL0890-0300
Gas Inlet Tube (2m)	PL0890-0305
Exhaust Hose (PVC-2.0m)	PL0890-0310
Waste Hose (Tygon) 7cm	PL0890-0315
Solvent Waste Container (500ml)	PL0890-0320
RS232 Communication Cable	PL0890-0325
Varian ELSD Mains Lead (UK)	PL0890-0330
Varian ELSD Mains Lead (EURO)	PL0890-0335
Varian ELSD Mains Lead (US)	PL0890-0340
I/O cable	PL0890-0345
Remote Start Cable	PL0890-0350
Varian ELSD Operation Manual	PL0890-0355
Varian ELSD Service Manual	PL0890-0360
Varian ELSD IQ/OQ Workbook	PL0890-0365
Varian ELSD Control Software	PL0890-0370
Varian ELSD Dimension Software	PL0890-0375
Varian ELSD Driver for Chemstation	PL0890-0380
ELSD Nebuliser	PL0890-0390
Leak Sensor Assembly	PL0890-0395
Mass Flow Controller	PL0890-0400
Photo Detector Assembly	PL0890-0405
ELSD Light Source	PL0890-0410
Fan Assembly	PL0890-0415
Front (White) LED Assembly	PL0890-0420
Gas Inlet Assembly	PL0890-0425
AR20 Regulator Assembly	PL0890-0430
Front Outlet Tube	PL0890-0435
ELSD Key	PL0890-0440
Front Panel Moulding	PL0890-0445
Solvent Inlet Connector (1/16th)	PL0890-0450
ELSD Grey keypad	PL0890-0455
Varian 380-LC Display Window	PL0890-0460
Varian 385-LC Display Window	PL0890-0465
Varian 380-LC Main PCB	PL0890-0470
Evaporator Cartridge	PL0890-0475
Evaporator Heater Assembly (No Cartridge)	PL0890-0480
Varian Neb Mount Assembly	PL0890-0485
Neb Chamber Assembly	PL0890-0490
Exhaust Tube	PL0890-0495
Exhaust Waste tube	PL0890-0500
Glass Sleeve, Neb Chamber	PL0890-0505
Vapour Sensor	PL0890-0510
Varian 385-LC Main PCB	PL0890-0515

Varian 380-LC Power Supply	PL0890-0520
Gasl Inlet Frit (10µm)	PL0890-0525
MFC Inlet Plug	PL0890-0530
Varian 385-LC Power Supply	PL0890-0535
FFKM O-ring (19.30x2.40)	PL0890-0540
FFKM Neb O-Ring (6.0x1.0)	PL0890-0545
PTFE Nebuliser Chamber	PL0890-0550
Nebuliser Waste Tube	PL0890-0555
P-Trap Diffusor	PL0890-0560
Viton O-ring (19.30x2.40)	PL0890-0565
Viton O-ring (0.7x1.0)	PL0890-0570
Viton O-ring (15.30x2.40)	PL0890-0575
Light Trap Assembly	PL0890-0580
Prism Assembly	PL0890-0585
Optics Heater	PL0890-0595
O-ring (21.95x1.78)	PL0890-0615
O-ring Nitrile, Prism	PL0890-0620
Optics Prism	PL0890-0625
Peltier Assembly	PL0890-0630
Mains Inlet Fuse (Pk 5)	PL0890-0635
Serial/USB Adapter	PL0860-0620

INSTRUMENT SPECIFICATIONS

Light Source	LED 480nm
Detector	Photomultiplier Tube
Temperature Range	
Varian 380-LC	
Evaporator	OFF, 25 to 120°C
Nebuliser	OFF, 30 to 90°C
Varian 385-LC	
Evaporator	OFF, 10 to 80°C
Nebuliser	OFF, 25 to 90°C
Nebuliser Gas	
Typical inlet Pressure	60-100PSI
Maximum Inlet Pressure	100PSI
Gas Flow Rate	Up to 3.25SLM
Eluent Flow Rate	0.2 to 5ml/min
Analogue Output	0-1V FSD
Digital Output	24bit (10Hz & 40Hz) via serial port
Communications	Serial I/O (RS232) Contact Closure TTL Remote Start Input
Operation	Graphical Vacuum Fluorescent display and keypad Windows based PC control
Power Requirements	90/120V AC or 220/250V AC, 50/60Hz
Dimensions (wxdxh)	200x450x415mm
Weight	
Varian 380-LC	11Kg
Varian 385-LC	13Kg

CLEANING & DECONTAMINATION PROCEDURES

WARNING

Switch off and disconnect power cord from instrument before cleaning or decontamination. Allow any hot parts to cool before proceeding.

Cleaning

The exterior of the instrument should be cleaned by wiping down with a soft cloth moistened with dilute detergent solution, followed by wiping down with a cloth moistened with deionised water. Ensure that no moisture enters the instrument. Allow instrument to dry off completely before reconnecting power.

Decontamination

The operator should wear appropriate personal protective equipment for this operation (gloves, safety glasses, lab coat and respirator if level of hazard has been risk-assessed to be sufficiently high).

Disconnect the instrument completely and remove it to a fume cupboard if necessary. Empty the P-trap before moving the instrument. (See “Storing the Instrument”, pg 8). Open the cover of the instrument to see if any solvent has contaminated the interior.

Excess quantities of liquid spilt on or inside the instrument should be mopped up using absorbent cloths, followed by repeated wiping down with soft cloths moistened with Acetone or deionised water (as appropriate to the spilt solvent) until the last traces of the hazardous liquid have been removed. If liquid has collected in the drip tray around the leak sensor then be very careful not to damage or displace the sensor bead whilst mopping up.

Identify and if possible correct source of the leak. Inspect cabling, parts and surfaces to determine whether any damage has occurred. If in doubt, contact Varian, Service Dept for assistance.

Allow the interior and exterior of the instrument to dry out completely before closing the cover and reconnecting power.

Dispose of contaminated waste appropriately.